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THE AMERICAN GAS LIGHT JOURNAL

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Annual Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY, MONTCLAIR, N. J., Sept. 6, 1898.

There will be an annual meeting of the American Gas Light Association held at Niagara Falls, N. Y., on Oct. 19, 20 and 21, 1898.

The meeting will be called to order by the President, Joseph B. Crockett, of San Francisco, Cal., at 10 A.M., on Wednesday, Oct. 19, in the meeting hall at the International Hotel, the headquarters.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may thereby be averted.

The International Hotel is conducted on the American plan, and rates are as follows:

Large parlors on first floor, $3.50 per day; all rooms on second and third floors, $3 per day; rooms with bath, $4 per day. At that season of the year we will be able to have the whole house.

The meeting hall will be on the parlor floor of the International Hotel; thus the headquarters and hall will be in the same building.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name, address, etc., as it appears on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary.

Remember, all applications must be in the Secretary's hands by Oct. 9, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"The Effect of the Depth of Fire upon the Practical Efficiency of a Water Gas Generator," by Mr. J. M. Rusby, Jersey City, N. J.

"Notes on Mains and Main Laying," by Mr. Walton Forstall, Philadelphia, Pa.

"The Loss of Illuminating Power of 25 to 30-Candle Gas when Mixed with Air," by Dr. E. G. Love, New York city.

"A Comparison between the Cost of Pumping Gas by Steam and Gas Engines," by Mr. H. L. Rice, Norfolk, Va.

A paper by Mr. E. C. Jones, San Francisco, Cal.

A short paper by Mr. Irvin Butterworth, Columbus, O.

In addition to the above there will be short topics by Mr. H. L. Doherty, Madison, Wis., and Mr. E. G. Cowdery, Milwaukee, Wis.

All questions for the Question Box should be sent to the Secretary as soon as possible, in order that they may be printed in the next circular before the meeting, thereby insuring their discussion.

During the days of the meeting all announcements will be posted on the bulletin board in the meeting room. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear

their membership badges in plain sight, thereby greatly aiding the officers of the local committee in their work by affording a ready means of recognition.

In order that the Year-book containing the report of this meeting may be published and issued to the members immediately after the meeting—

Notice is hereby given, that if any of the speakers at this meeting desire to correct their remarks before they are printed, they will be given an opportunity before leaving Niagara Falls, but not after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned in to the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted (viz., full fare going and one third fare returning by the same route) by the several passenger associations named and under the conditions noted :

The Trunk Line Passenger Committee, covering the territory west of New England and east of Niagara Falls, Buffalo and Salamanca, N.Y.; Pittsburg, Pa.; Bellaire, O.; Wheeling, Parkersburg and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Central Passenger Association, covering the territory bounded on the east by Pittsburg, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Illinois ; on the west by the west line of Cook county and the Illinois and Mississippi rivers, to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis ; and on the south by the Ohio river, including points on either side of that river.

The Southeastern Passenger Association, covering the territory south and west of the Virginias and south and east of the Ohio and Mississippi rivers, and the Western Passenger Association, covering the territory west of and not including Chicago, Peoria and St. Louis, in other words, the territory west of that of the Central Association, have refused to grant the rates. Members from these territories should buy tickets from starting point to the nearest or most convenient point in the territory of any of the Associations granting the reduced rates, and at such point purchase tickets through to Niagara Falls and obtain a certificate.

The following extracts from the regulations of the railroads are cited for the information of the members. The special rates are granted subject to these regulations :

First. The reduction is conditional on there being an attendance at the meeting of not less than 100 persons holding certificates.

Second. Each person to obtain the excursion rate must purchase a first-class ticket (either limited or unlimited) to the place of meeting, for which he will pay regular fare, and upon request the ticket agent will issue a printed certificate of purchase of the standard form. Agents at all important stations are supplied with certificates.

Third. If through tickets cannot be procured at the starting point, purchase short-trip ticket to the most convenient point where such through ticket can be obtained, and there purchase through to place of meeting, requesting a certificate from the ticket agent at the point where each purchase is made.

Fourth. Tickets for the return journey will be sold by the ticket agent at the place of meeting at one-third the highest limited fare only to those holding certificates, signed by the ticket agent at point where through ticket to place of meeting was purchased, and countersigned by signature written in ink by the Secretary of the Association, certifying that the holder has been in regular attendance at the meeting.

Fifth. No reduction of fare will be made on the return passage if the going ticket is purchased more than three days before the opening date of the meeting ; except that when meetings are held at distant points to which the authorized limit is greater than three days, tickets may be purchased before the meeting in accordance with the limits shown in regular tariffs.

Sixth. Certificates are not transferable, and return tickets secured upon certificates are not transferable. The transfer of any such is liable to prevent the securing of reduced rates for future meetings.

Seventh. The certificate of agent at starting point, duly endorsed by Secretary of Association, must be presented to ticket agent at place of meeting, within three days (Sunday not reckoned) after adjournment of meeting. The return ticket will be for the line or lines covered by the going ticket.

Eighth. No refund of fare will be made on account of any person failing to obtain a certificate.

Special.

If a sufficient number of subscriptions are obtained, the social programme will be as follows : Wednesday evening, reception and hop ; Thursday evening, banquet to which ladies will be admitted on equal footing with the gentlemen ; Friday evening, informal hop ; Wednesday and Thursday, carriage drives for the ladies ; Friday, visit the Niagara Falls power house and other places of interest, and trolley ride down Gorge Route to Lewiston and return.

Tickets admitting members and friends to these entertainments can be had for $5 each. If you wish to join in them please sign inclosed card and return to the Secretary at once. It will be necessary to have at least 100 subscriptions.

Be sure to obtain your railroad certificate when buying your ticket for Niagara Falls, as the greater the number of certificates handed in, the easier it is to get the reduction in rates for future meetings.

Apply for tickets and certificates at least 30 minutes before train time.

Each person must sign his own certificate at time of purchasing for Niagara Falls.

Be sure to hand the Secretary your certificate as soon as you reach the headquarters.

Apply for return ticket at least 30 minutes before train time, and have your certificate with you.

Any person, ladies included, attending the meeting, is entitled to the reduced rate from the territories named.

Members will please hand their certificates to the Secretary, or his clerk, upon arrival at place of meeting. If there are 100 members present, holding certificates, each certificate will then be properly indorsed and handed back to owner, before adjournment.

Extracts from the Constitution.

Sec. 12. Application for active membership, or for associate membership, or for transfer from associate to active membership, must be received by the Secretary at least 10 days prior to the meeting at which the application is acted on.

Sec. 51. No member who owes two years' dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the proceedings.

Sec. 52. Any member whose dues shall remain unpaid for a term of three years may be dropped from the roll of membership by a vote of the Council.

ALFRED E. FORSTALL, Secretary.

BRIEFLY TOLD.

"NEWBIGGING'S HANDBOOK."—The sixth, and centenary, edition of the "Handbook for Gas Engineers and Managers," which has been looked forward to with eagerness for some time, is now on sale. It is needless to say that the author and compiler of the Handbook is Mr. Thomas Newbigging, whose record in connection with the gas business is international in point of spread, is lengthy in number of years, and fruitful in that which resulted to the good of the profession and to himself from his labor and works. Veteran that he is, age seems not to have dulled his capacity as an author, digester and compiler, for the current edition of the Handbook shows much advance over its predecessors, in that Mr. Newbigging has left out some things that were over told, has rewritten the text of many old-new matters, thus bringing their description up to time, and has given much that is new, as between the times of the 5th and 6th editions of his always meritorious book. It is regrettable, perhaps, that he did not pay more attention to water gas ; but that is the author's business alone, of course. The result of the joint efforts of the author and his publisher—Mr. Walter King, of London, is the latter—is a handsome 4to book, holding 535 pages between its covers. The illustrations number 239, and the frontispiece is an excellent engraving of William Murdoch. The book comes in two styles of bindings ; the first in morocco, gilt, the price of which is, on orders to us, $7 ; the other is in roan, gilt, and the price is $6. It should be understood that these prices do not include charges for forwarding. Those who order the book from us are asked to specify whether they wish it forwarded by mail or by express.

NOTES.—Manager W. P. Elliott, of the Chicopee (Mass.) Gas Light Company, has had a busy time of it this season, both at the works and on the distributing divisions of the plant. The works betterments include four new purifying boxes, 8 feet by 14 feet by 3 feet 6 inches, with 10-inch connections and a Hearne center seal ; an 8-foot station meter ; a storage tank for oil up to retaining 30,000 gallons, and foundations for a new set of generating apparatus, which is to be moved from the old plant at Chicopee Falls. The main system was largely added to, and it now measures about 15 miles ; 600 meters are in place, and 200 stoves are doing good work in adding to the output.——Ald. Geo. S. Potter, of the 24th ward, Buffalo (N. Y.) Common Council, is trying to convince his associates that the city should engage in the manufacture of gas on public account.

[Official Report—Revised by the Secretary—Concluded from Page 349.]

SIXTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

Held at San Francisco, Cal., July 19 and 20, 1898.

Second Day, July 20, Afternoon Session.

QUESTION BOX.

The President—Although the Question Box is not full to overflowing, it is nevertheless true that some of the queries which it contains are well worth considering. I hope the questions will be thoroughly discussed.

The Secretary—The first question is:

"Should meter reading be taught in the public schools?"

Mr. Guldlin—Gas or electric?

The Secretary—Both. This question was handed in by a well-known member of the Association, who seems to have just stepped out "for a moment," possibly because he knew that his inquiry was about to be considered. It appears that the question has been discussed in some of the Eastern Associations, and that one of the foreign journals devoted to the gas industry printed a column editorial to the question of the advisability of teaching meter reading in the public schools. I am a convert to the belief that it should be taught in the public schools. Heretofore, no matter what means he may have employed, the gas man has not been enabled to teach his consumers how to read a meter. I have grown gray in that attempt, and expect all of you have encountered a like unwillingness. They never will understand it; they don't want to; they don't care to. It seems to me that such knowledge should be spread, for the protection of both gas and electric light men, for electric meters are now coming into vogue prominently, and I do not see any reason why everybody should not be taught to read his meter. If the consumers would read their meters the life of the complaint clerk at the counter would be materially happier than now, and there would be better satisfaction in the matter of gas bills besides, because you can convince reasoning men, if you talk to them in your office of the ability of the gas meter to register honestly; but you cannot always prove to them, by the reading of a meter, after the meter has been taken three or four weeks, when they think of making a complaint, that the record then read so and so. In this matter we have adopted a system in our office that I find beneficial, which is a notification by postal card to every consumer of the statement of his meter when originally set; and, if it is changed, of the change of the meter. I find it is very satisfactory. They can keep track of it in that way. However, that is outside of this question. In the higher grades of the grammar school, or in any high school class, this could be made a subject for a discussion once a month. Practically lessons could be given to the children, or to the young men and young women, as to the construction of the meter. Every gas company would be very glad to give to each high school in its place a meter for instruction purposes, and with a knowledge of its construction and operation the simple, easy and successful working of the meter would be in time familiarized amongst the people. That is my response to the question.

Mr. Parker—The introduction of the prepayment meter would seem to solve this problem so far as the gas end of it is concerned. I don't believe there are three people in Napa who can read their meters; in fact many of them don't know what the price of gas is. Their only thought is, "How much is the bill?" Wherever we introduced the prepayment meter we have not a kicker on the line. At first we put those meters in for troublesome customers. In some cases where, with the ordinary meters, they grumbled at paying $4 a week they now pay with the prepayment meter $8 a week, without a word of complaint. I think the prepayment meter has been quite a boon to gas men, and in its use we find very little trouble. In cases where safe paying consumers find fault with the ordinary meter, we have adopted for their instruction and pacification a system followed by Mr. Clements at Red Bluff. Small blanks showing dials of meters without any index pointers are given to boys to collect statements. They simply take the statements and mark on the diagram the position of the hands. These are brought to the office and the bill is made out. If there is any subsequent trouble about the statement, this diagram is produced generally to the satisfaction of the consumer. I am opposed to the idea of cramming the already over-crammed pupils of the high schools.

Mr. Clements—As the members of this Association are usually representative men in their respective communities, no doubt many of them are connected with the directorship of the public schools, and as this subject seems to be one of considerable importance, and as these gentlemen are so interested I think this question might be properly submitted to the directors of the public schools which they represent.

Mr. Petch—Notwithstanding the prepayment proposition I believe it will be quite a while before the companies use exclusively the prepayment meter. In my experience the few consumers whom I have been able to persuade to learn to read their own meter have invariably been those with whom I have never had any trouble. It made no difference how large or how small their bills were before we sent our collector, they knew what their bills would be and were ready for us. I fully agree with Mr. Britton that it would be a good thing if all our public school children were taught to read meters. It would not take very long to accomplish this object, and the result would be of incalculable benefit to gas companies in the number of kicks given and complaints made. We tried the Clements' plan, but after a while, however, we discarded it. It would do for a few meters, but when you get quite a large number of these diagrams on your hands it is hard work to keep track of them. One way or another we got losses, no matter what care we took in filling the stub. In fact, we put them on both the bill and the stub (on the bill on one side and on the stub on the other) so they could see for themselves the position of the hand on the bill, and then examine the meter to see if the accounts were correct. At the same time, after quite a while had elapsed, to the time the complaint was made, we often failed to find the particular record desired, and this failure seemed to cause stronger suspicion. On the whole, I believe it would be a good thing to have meter reading taught in the public schools.

The President—For my part I fully agree in all Mr. Britton said. The popular idea concerning the construction of the meter is that it is a perpetual motion machine which will go on in its work of registering whether gas is going through it or not. It seems almost impossible to get that idea out of the minds of the people. Perhaps a lecture or two on that subject in the course of a year might dispel that thought, because I do not suppose the directors of the public schools entertain the belief that the meter is an example of perpetual motion. I think Mr. Britton covered the case pretty well.

The Secretary—The second question is:

"What are the advantages or disadvantages of testing meters in place?"

Has Mr. Kinney anything to say on that subject?

Mr. Kinney—I think that opens up a subject wherein is quite a chance for a difference of opinion. The reply would be governed to a great extent by local conditions. As far as testing meters is concerned, I think the disadvantage, as far as my limited observation goes, of testing meters in place, is that the meters often are located where tests are almost impossible. A meter may be tucked away in some little hole where it would be out of the question that a man had space enough to make a test, consequently, unless the tester is extremely honest and doesn't care anything for his appearance, he will look at it awhile, write down a report (?) and go on to the next one. Under these circumstances the probabilities are that testing meters in place will not be very successful. I believe, were the meters located in accessible and clean places, and the gas companies showed the meters the respect which they desire should be entertained for them by their customers, I think it would be much better for all concerned. The meter is part of the bookkeeping system, and I don't wonder that some of the customers believe their bills are made at so much a month, when, for the life of them, they cannot look through the glass of the dial to see where the hands are, or anything else about it. In the matter of electric meters I think without any exception they should be tested in place. It is a different proposition from a gas meter. To get the best results the electric meters should be tested under conditions similar to those under which they are used.

Mr. Adams—We have had some experience in Portland in testing meters in place, and the result of such experience is the belief that any gas company having a suitable proving room should there prove its meters. However, with us the variation of temperature is such that I am satisfied the correction would be less if we tested them in place. That is, I think the disadvantages of testing them in place are great in many cases; but on the other hand if the temperature varies so much in the testing room I don't see but that it is just as fair to test them in place as it is to test them in the so-called proving room.

The President—On this subject I think I am perhaps better qualified to speak than anybody else in this room. I had a long correspondence with Mr. Milsted, of the American Meter Company. I suppose at least

eight letters passed between us, and in mine I furnished him a lot lot of statistics which showed the utter unreliability of testing meters after they were removed from the place where they were. To give you an idea of it, we tested meters over and over again in place which showed 10, 14, or 20 per cent. slow, and afterwards took those same meters into the shop and tested them with a prover, when, sometimes after one and sometimes after two trials, they tested "O.K.," or within 1 or 2 per cent. I am now satisfied that one great reason going to make up what is called leakage is caused by the meters passing more gas than they register. I have repeatedly examined meters after they have worked some time, and find they accumulate dirt, which dirt is stuck by a very imperceptible amount of tar that gathers on the valve. Thus is formed a ridge or false face, and in place of the cap of the valve being in contact with the face, it is lifted up by a lot of small ridges which press round more than a small fraction of an inch deep, so that as it travels the gas enters not only by the ports but also by these ridges. When you test a meter in place without moving it, if your test of the meter is correct you will get a pretty fair result; but if you take that same meter, disconnect it, tie a rope around it and sling it over a man's back, then the light oils, which always remain on top of the floor in which the valves are bedded, will wash over the valve and lubricate it so that when you come to test it the dirt will wash off and the meter is brought back into its original condition. I think I tested some 50 meters esprcially for Mr. Milsted—I have not the correspondence with me, of course—and he was astonished with the results which I gave him. The tests were very carefully made, and meters that tested 14 and 15 per cent. slow in place, after slinging them around enough, generally would, the first time, not come so near correct; but the second or third time they generally came back to the original condition of the meter. Now I don't know that anybody else has had a like experience, but I have made that a particular study, and am, therefore, prepared to say that the test of a meter that is removed from its place and carried into a shop to be tested is not a just measure of its condition.

Mr. Petch—I fully believe in testing a meter where it is set. I have tested some from an economical standpoint for one thing. That is, I think I said in my paper a year ago that there ought to be a systematic time for testing meters, and I believe they should be tested at least once a year. I can test four (probably six) meters in place while I would be testing one by taking it out, removing it to the shop and putting it on the prover; and so we test our meters all that way, and are reasonably sure that trial of the meter is correct. Another thing I find, which is a great source of satisfaction to me, is, if I have to argue with a consumer about a large bill, or a bill that is perhaps a little unusual, through perhaps the carelessness of the consumer (which nine-tenths of the time is the case), I can conclusively prove to him, when he swears that the meter is not right, never was right, and was never intended to be right—if he is reasonable at all—from a test of the meter, in five minutes that what I told him was perfectly true. I have found in innumerable cases that testing the meter in place, by a test meter which he can easily read himself and understand, its correctness is conclusively proven to him there. I say it is a source of great satisfaction to a gas man to be able to test a meter where it is set.

Mr. Osborne—We have all no doubt tested new meters before they went out, and we all know that these meters run slow for a starter, some of them as much as 20 per cent. The question is, when do they get up to their regulating speed, and how much do we lose? I cannot understand how it is that they should be slow. Of course they are liable to be a trifle stiff on the start, but when is it that they become correct? Perhaps the manufacturers could tell us.

The President—Did I understand you to say that some new meters proved 20 per cent. slow?

Mr. Osborne—Yes.

The President—Such has not been our experience, and we frequently buy 50 new meters, testing them all before they go out. We generally find them within 1 or 2 per cent. of correct. The meters you speak of must have been lying in some place uncorked.

Mr. Gregory—I am glad there is a disagreement here in the discussion, because it probably proves that the new meters are nearer correct than some people imagine. Our friend on the right says that new meters will run slow, or even irregular for that matter. We don't know anything of that sort where we have been testing them ourselves, and I want to ask if there is not a great difference in the effects of oil gas and coal gas on meters? Will it not make a difference and won't it create this dirty condition of which you speak with oil gas when it is mixed with your coal gas? I say that for the resson we have very little trouble with our meters when we are making coal gas only. It is very well purified, is a very pure clean gas, and I have always been able to stand up and swear by the meter. I like to be somewhat honorable with the citizens of our town. In a small town the public get acquainted with a gas man and become friendly and ask his advice on different subjects, and would like to be friends together, so when I swear by the gas meter I want to feel that I do it honorably; and I tell you I do it nearly every day.

The President—I want to correct you in one respect. When I say those ridges are formed, I mean it takes two or three years to form them as a general thing. They are not caused by impurities in the gas, for that is perfectly clean, but with any kind of gas there will be a deposit on the face of the valves, and it takes little to pass 10 per cent. or more gas out of those ridges than is registered. You have to handle that meter very carefully in testing it or you will destroy the ridges. On almost all meters that are out any length of time these ridges exist—they are very small, but they are there; and but little difference is occasioned whether it be coal gas, water gas or mixed gas that passes through the meter.

The Secretary—It seems to me it all hinges upon the honesty of the man who tests the meters. In towns where you have less than 1,000 meters the superintendent, or his assistant that is close to him, will test the meters honestly; but where you run into thousands of meters, and have to send a man out with a wagon to go over the district, there is an awful temptation on his part not to test meters. I have been testing meters in place for about three years, but finally had to abandon it. Suspicion, by reason of a falling off in the bills, would be aroused, and we depended upon the test in place. I know of more than a dozen cases in our districts where people have secured gas for nothing for a year, because I depended on the honesty of the man sent to test the meter. I don't think in big towns that meters should be tested in place. I have had something of the experience of the President respecting meters tested in place, that showed incorrect, which on being tested in the shop showed correct. I think that is due as he says to the deposition of tar and other substances on the valve. I know of meters which we cannot get to register at all. In cigar stores, for instance, where they have a cigar lighter, enough gas will leak through the valve, unless it is properly in place, to supply that little cigar lighter, of which gas no registration takes place.

Mr. Kinney—It seems rather strange, according to the Secretary's remark, that honest men cannot be found to test meters. It strikes me that the difficulty, as I stated before, is largely chargeable to the faulty location of meters. A man qualified (if I may use such a term) to be honest, or to remain honest, is usually a man who can get a better position than that of crawling into some holes, where I have seen lots of meters located, and I think if some of the gas companies would place the meters in positions showing that they were machines of some importance and worth, thus indicating to the customers that the companies cared for their meters, and that the machine was not one of perpetual motion, such practice would be good not only for the customer but for the company.

Mr. Petch—Just one moment. For the life of me I fail to see where that can be an excuse for not testing a meter in its place. For instance, using a certain length of hose, it would just seem to be a matter of geting hose enough. You could take the meter into the parlor and test it. Just disconnect the meter, bring it out wherever you please and test it. It can be done easily enough.

The President—The Secretary and I do not agree—I do not suppose any two persons will agree always—but I would like to say that I always have been and am still a firm advocate of testing a meter in the place where it is practicable, especially where there is any suspicion of leakage. And I have never found any difficulty in obtaining a proper test of a meter, or in finding amongst our employees somebody that we could absolutely trust to go on faithfully with what they attempted.

The Secretary—The next question is:

> "What experience have the members of this Association had in the use of a gas engine for running a rotary exhauster?"

Mr. Jones—We have been so running a Mackenzie exhauster for I think eight or nine years.

The President—For pumping gas?

Mr. Jones—Yes; but it is only for transferring gas from one station to another. I think there would be great difficulty in governing a gas engine where the engine is to be used in connection with the exhauster taking gas from the hydraulic main.

The President—I incline with Mr. Jones to think it would be very difficult indeed, and if I had it to do I should require a bye-pass on it, for it is extremely delicate and much larger in proportion to the capacity

of the exhauster than is usual with running a steam engine. In fact, I have seen devices of that kind with cone pulleys, but I have never seen it done with any satisfaction.

Mr. Jones—I believe that gas companies should use gas engines wherever they can.

The President—I think so too. Don't you think, Mr. Jones, it could be done by having a very large bye-pass on the exhauster?

Mr. Jones—I am quite sure, yes.

The President—But without a bye-pass, a 4-inch on a 24 or 30-inch exhauster, it would be of no value whatever if it was going to run with a gas engine at a uniform speed. It could be done, however, I am satisfied.

Mr. Guldlin—I think the question of operating exhausters with gas engines has been admitted to be correct and it can be done, but the trouble against the introduction comes from the fact that a gas works always has a steam plant, and the amount of steam or, more properly speaking, the amount of additional fuel required for furnishing steam to the exhauster has been so small that it has been very difficult to tell what it would cost, whereas with gas you are using a product that could be sold and consequently has a greater value. Another feature regarding a steam plant is this that gas works, especially the smaller ones, have more or less debris and refuse to burn up under their boilers, and as a rule they have more of these than they require for ordinary steam use. A gas engine, to give the best efficiency, of course should run at a uniform speed. The regulation consequently would have to be done, as the President said, by a compensator, on the same principle that the old Mackenzie exhauster was constructed, and the regulation of the engine to maintain its speed is of course then attained by missing explosions. There is no doubt in my mind, from what experience I have had with gas engines, that regulations could be made sufficient for the perfect governing of the exhauster. When it comes to a question of simply pumping gas from one station to another, and where a pumping plant is somewhat isolated from the works requiring the steam to be brought from some distance, there is no question whatever but that a gas engine should be used. It seems though that everybody is afraid of starting in and changing from the old-time method, and so the gas engine is still waiting for an opportunity of that kind.

The Secretary—The next question is:

"Has any company on the Coast tried to make oxide from iron borings and salt water, and with what success, in purification?"

The President—When I went to San Jose, in 1866 or 1867, they were using nothing there but borings, which were made rusty by using salt water or sal-ammoniac. Either one would answer the purpose, and that was all the purifier they used.

Mr. Parker—We endeavored to do that thing some 15 years ago. We succeeded in purifying the gas all right, but we were bothered by a deposit in the burners of a fine oxide. That bothered us right straight along, and we had to give it up. As far as its purifying qualities were concerned, we had no fault with it. It purified and revivified all right.

Mr. Gregory—I never could understand the value of making oxide for purposes of purification by the use of iron borings. I never used iron borings myself entirely. I use iron in addition to copperas oxide. Such a thing as rusting iron borings I have done, but have never used salt water. I have rusted it with sal-ammoniac. I put iron borings on copperas oxide; that is, sprayed the borings and let it stay there, usually a small amount of it, on the oxide when I put it in the boxes. Each time as it went in I gave the man orders to put a small coating on top of the copperas oxide. Then I have a habit of wetting the material anyway to keep it moist. But such a thing nowadays as undertaking to rust iron before it was put in I never do. The ordinary amount of moisture you have in your oxide will be sufficient to rust the iron borings.

Mr. Guldlin—I am interested in the discussion of this question for the reason that I have for the last three years been recommending the making of oxide in the manner embodied in this question; that is, taking cast iron borings and spreading them over a layer of sawdust or shavings, and then wetting it down with salt water. The reason I have done that is purely a matter of economy in the preparation of the oxide, and I can say this for the method that it has been used in the St. Louis gas works for several years, Mr. B. E. Chollar having introduced it there. They are using large quantities of it and find it is a very economical way of obtaining a very satisfactory oxide. I have also heard of some purifier records there which I think stand very high compared with any other mixture. The trouble which you will experience in preparing oxides in that manner will always be found to be due to the fact that the iron has not been thoroughly rusted or oxidized in the preparation, and if it is not so and you have free iron, you will get what is called iron carbonyl, which will be carried to your burners and present itself in the shape of what you call "whiskers," a sure sign that your oxide is not thoroughly rusted. Then the only thing is to get it outside of the box and put some old oxide in. If you will take oxide and prepare it, taking 15 inches of shavings and about 3 inches of cast iron borings and wet it down occasionally with salt water or sea water, and turn it over and give it a chance to get thoroughly rusted before you put it in the box, you will have oxide which will give you satisfaction unless the local conditions on the Coast here will create new results. In regard to wetting down with salt water, I will say there is no special formula or time for doing it. Do it when you have nothing else to do. Spread it out, wet it down, shovel it over again, and wet it down, and when you are sure in two or three weeks that the thing is thoroughly oxidized, then use it in your boxes. If you should find any sign whatever at your burners of the formation of what is called "whiskers," get it out and mix some old stuff with it. Simply take 15 inches of pine shavings and about 3 inches of fine cast iron borings, mix those together and wet it down and you will have as cheap oxide as I believe can be made.

The Secretary—When I was in Philadelphia this spring I had a conversation with the superintendent of one of the large stations of the United Gas Improvement Company, who told me that for about two years they had abandoned the use of copparas, and had been using iron borings and salt water (20 pounds of iron to a bushel of shavings) and produced better results than they ever had been able to do with copperas. I don't believe the salt water adjacent to our gas works would be the best kind of salt water, especially in Oakland. It is impregnated with the sewage of that immense country; and I don't believe it is salt water.

Mr. Guldlin—What I have tasted of your salt water is salt enough for that purpose.

Mr. Jones—It is my impression that copperas is much more expensive in the Eastern States than it is here. We get it at about the price we pay for our anthracite coal. I think it is two or three times as expensive in the East as it is in San Francisco.

The President—I think so too. As you know where we make oxide we get the atomic iron in an anatomized condition, whereas no gas ever penetrated through the core of a piece of iron boring.

Mr. Jones—You have a metallic core, and that is dead matter.

The President—I mention the fact of seeing that operation in San Jose, during 1876 and 1877, when Mr. Quilty's father-in-law was managing the works there. That was the first time I ever saw iron borings used in purifying gas, and it did very well; but at that time you would have to pay 5 cents a pound for copperas, whereas now you can get it for three-quarters of a cent a pound, and sometimes even less. But I do not see that there would ever be economy anywhere in using iron borings, if copperas could be obtained as cheaply as we buy it here.

Mr. Guldlin—I understand copperas is worth about 65 cents per cwt.

Mr. Jones—It costs more now.

The Secretary—Ninety cents per 100 was the last price.

Mr. Guldlin—About a cent a pound was my understanding of its value. You can buy iron borings for $5 or $6 a ton anyway, and you certainly cannot get anything better than oxide of iron pure, which you get direct from iron borings. It is only the oxide of iron that you are after in copperas.

Mr. Jones—That would be $350 a box for our 25 foot purifiers, and I don't know when we have spent so much money for our purifying material. Again, I think the objection to the use of metallic iron is, as the President already stated, that the purification of gas is due to surface contact with ferric oxide, and it is impossible for rust to form inside of a lump of iron; so that by using lumps of iron you simply make use of the surface of these lumps for purifying purposes. The rest of it is a lot of dead material waiting to be oxidized, whereas if you have it in a fine powder attached to sawdust or shavings you get the maximum results with the last amount of weight on your trays.

Mr. Guldlin—The oxide of iron comes direct from the metallic iron, and coats the shavings and keeps on coating them as long as any are left, and you have nothing left except coated shavings. I understood the Secretary to say 20 pounds of iron per bushel of sawdust. That is about 5 cents a bushel, and I don't think we could make copperas oxide of equal strength at such cost.

Mr. Jones—How much gas will a bushel of oxide when properly protected purify?

Mr. Guldlin—I will answer that question by stating a result reported

to me by Mr. Chollar. They filled four purifiers about 24 feet square, and passed gas through those until over 100,000 cubic feet had been passed per bushel of oxide without changing the material in the boxes. Now, I said 100,000, but am satisfied in my own mind that the purification was considerably in excess thereof. I want, however, to be quite sure that I am stating it conservatively.

Mr. Gregory—I guess you will find if you dissolve copperas in hot water and use it for rusting your shavings you will get on a great deal cheaper.

A Statement Respecting Papers Unread.

The Secretary—As the hour is late, and as the banquet comes very soon, I know a number of the members would like to make preparation for it. We have about exhausted everything on the programme excepting three papers (it is the first time in the history of the Association when we have not been able to read all the contributions that were offered), one of which is by President Eichbaum, and is a continuation of his "Reminiscences;" the second is by Mr. Foveaux, on "A Closed Purifying Box;" and the third was to be by myself on my pet hobby of "The Treatment of Municipalities." It is possible that we may conclude to publish those without discussion and have them printed.

Votes of Thanks.

Mr. Grimwood—Before the meeting closes I wish to move an especial vote of thanks to Secretary Britton for the compilation of our proceedings in book form. I think that record is something we all appreciate, in that we have found it, and will continue to find it, of great value to us.

The motion was put and adopted with applause.

The Secretary—I do not consider that a vote of thanks was at all necessary. I hold it is my duty to do all that comes before me as Secretary, as any other member would in my place. Of course I am obliged to you for your expressions of goodwill, and I have had it all along the line ever since that book was published. I will say it entailed a great deal of labor, but I am not alone entitled to thanks in that matter. Mr. Jones was associated with me on that committee, and he, just as diligently and as carefully as I, went over all the work and devoted his hours to reading the proof sheets I sent him.

Mr. Jones—I move a hearty vote of thanks to Editor Hollidge showing that we appreciate his industry and diligence in preparing the large number of Wrinkles presented for our consideration. It must have been quite a task to gather them together. In that vote I would also include Editor Clements, whose excellent Experience budget contained so much interesting matter. (Adopted.)

On motion of Mr. Jones, Messrs. Hollidge and Clements were continued as Editors respectively of the Wrinkle and Experience departments.

The Secretary—There is one matter which ought to be put upon record by the Association. While in the programme, which I had made up for this year's session, acknowledgments have been printed to Mr. Dickey, of the Maryland Meter and Manufacturing Company, to Mr. Guldlin, of the Western Gas Construction Company, and to the San Francisco Gas and Electric Company for the favors they have shown, I think the acknowledgments should go on the records as votes of thanks before the Association adjourns. More especially perhaps should this apply to the San Francisco Gas and Electric Company for the continued use of this building for our meetings. Without such a place to meet, without such conveniences as have been given us, without the care and attention of the officers of the Gas Company to the members, and all the other incidental courtesies shown, the meetings could not have been the success which they have been in the past, and which they promise to be in the future. There is no other Association I imagine in the United States that meets in as beautiful apartments as we do, surrounded by all the luxuries that we enjoy. Our banquet room to-night will be a dream to all of you, through the efforts almost entirely of Mr. Jones. I do not want to appear to be putting too much praise on him at all—I do not want to single him out; but it is the fact. I know most of you know it, but it should be said so, and said so positively, and I do not want this meeting to adjourn without a vote of thanks to them and to Mr. Dickey, who kindly offered to pay the expenses of the luncheon at Hayward's voluntarily. The American Meter Company did that last year and the Maryland Meter Company this year. While there has been some question about our accepting favors from those people I saw no objection to it, and neither did any of the other officers. Our Association is small, and the revenue from its dues is not lavish, and we can spend our money in a much better way in printing the proceedings than for these luncheons, and if somebody wanted to give them to us there is no objection. Mr. Guldlin wanted to offer us a trip such as the committee might designate. The first endeavor was to get an excursion to Monterey, the next to Santa Cruz, but the railroad company would not make a sufficient concession in the prices of transportation to warrant us in taking it up or putting the burden of that expense on anybody, so that idea was abandoned, and the trip to Haywards, which I know you will enjoy to-morrow, was selected, and it will be unique in its way and enjoyable to you all. So I repeat the motion that a special vote of thanks be put upon record to Mr. Dickey, to Mr. Guldlin and to the San Francisco Gas and Electric Company.

The motion was carried unanimously.

On motion of Mr. Adams the meeting was declared adjourned.

[Prepared for the Journal.]

Some Comments upon the Tabulation of Papers Read Before the American and the Western Gas Associations.

By F. H. Shelton.

A short time ago the writer compiled a list of the papers that had been read before the American and the Western Gas Associations, which list was published in the Journal, issue of August 8th. The thoughts that led to the compilation and publication of such list were principally two; first, that such compilation would prove convenient to others looking up any particular subject; second, that it would afford room for comments of more or less interest upon the number, scope and tendency of the papers read before the named Associations, which comments, as below, the writer had in mind to make at an early date. Before having had time to do so, however, two very good friends of his, Messrs. Frederick Egner and John Gimper, both notable for the number of papers that each has given to the various Associations, have pointed out that the list was slightly inaccurate because of omitting one paper each that they had written. Before considering the list, therefore, it becomes desirable to point out how it was compiled and what it represents. It is offered as, while not absolutely, yet practically correct, and as recording the papers produced by the membership of the two largest American Gas Associations. It was compiled from the several last official bulletins, given out by the respective Secretaries, prior to the various annual meetings. The papers so bulletined are usually read. Yet now and then an additional one, or an extemporaneous address on a special subject occurs. Most of such are covered in the list, yet probably not all, owing to inability to take the time necessary to check off absolutely, over a period of 25 years back.

While the compilation may thus be inexact here and there, it is substantially correct, and as a whole undoubtedly shows the character and relative extent of the subjects treated in the papers of the two Associations in question.

In this connection it should be emphasized that it refers to the American and the Western Associations only. It does not cover the New England or the various State Associations. In these, several papers of the highest worth and note have appeared, but as most of these Associations have not published their proceedings in systematic form, that fact, and the inability to take the time necessary to dig out and compile the data from the various gas Journals, have prevented the listing of their papers by the writer at least for the present. That work still remains to be done for the good of gas men at large, and if Messrs. Egner and Gimper, or any others, will do it, and in such a perfect manner as to put into the shade the tabulation that is the subject of these remarks, no one will be more sincerely pleased than the writer.

Is is self-evident that such a complete and comprehensive record, including also the papers of the old Central New York Association, as well as the present New York Society of Gas Lighting, and the Boston Guild of Gas Managers, together with the American and Western lists that I have tabulated, would be of the greatest convenience and assistance to writers and students in all of the several Associations.

Disregarding for the present, then, the minor Associations, and considering the papers by the writers of the two principal ones as listed, we find that, as to subjects, they classify as follows:

Manufacture.

Coal Gas: General	17
Benches	27
Stoking machinery	3
Coke	3
Inclined retorts	6
Coals	2
Coal gas: Condensing and scrubbing	7

Residuals: Tar and ammonia	13
Water gas: Process papers	11
Water gas: Operation	4
Water gas tar	3
Oils	4
Oil gas	4
Purification	19
Oxide and lime	5
Gasholders	6
Photometry	8
Gas analysis	12
Total	154
Distribution.	
Street mains	9
Leakage	5
Street main governors	1
Naphthaline	6
Consumers' meters	10
House piping, etc	3
Burners	5
Incandescent burners	5
Gas stoves	8
Gas engines	4
Expansion of business	6
Office and accounts	4
Illumination	11
Total	77
General.	
Gas commissions	1
Gas associations	2
Municipal	5
Fuel gas	9
Natural gas	7
Acetylene	1
Electrical	6
General and miscellaneous	48
Total	79
Grand total	310

Possibly the first thing that strikes the observer is the preponderance of technical subjects compared with commercial matters. The memberships of the Associations is made up of gas engineers, officers, managers, owners and supply men, so-called. It is the engineering end, though, that gets the best hearing, as three-fourths of all the papers are upon topics relating to the works and questions of gas manufacture and distribution, as against the selling of gas. And that the engineers themselves in the main supply the paper is proven by checking off the list of writers, 75 per cent. of the papers being by "works men," or "superintendents" as distinguished from those constituting the "associate membership." While this has perhaps been wise in the past, have not the technical questions of manufacture become by this time sufficiently well settled to warrant a considerably greater proportion of papers in the future upon the *business* end of gas undertakings?

It is interesting to note that, while for a number of years more water gas *per se* has been made in this country than coal gas, the coal gas papers nevertheless far outnumber those upon water gas. This has been through two principal reasons: First, water gas construction has been in the hands of a few specialists, averse, for business reasons, to giving out too much detailed knowledge of their wares; second, because some of the larger companies, making quantities of water gas as to volume, have, however, not been proportionately, and sometimes not at all, represented in the Associations, in contrast to the large membership from smaller coal gas companies, which representation naturally results in a preponderance of coal gas subjects from such members. Twenty-seven papers have appeared on benches alone, and 51 more on direct coal gas topics, a total of 78, or 25 per cent. of all the 310 papers in the list. Water gas has but 18, and of this 6 per cent. 11 are "process" papers, and only 7 "practical," as popularly described. Next to how to make gas, the subject of purification seems to have been most wrestled with; and then, the subjects of illumination, gas analysis and consumers' meters, in the order named.

Generally speaking, the work's end has had the best of it, two papers appearing upon it for every one upon either distribution or general topics.

An analysis of the number of writers is interesting. Out of the total of 310 papers listed, 1 man read 10 papers; 1 read 8; 2 read 7; 4 read 6; 2 read 5; 11 read 4; 14 read 3; 30 read 2; and 98 read 1.

That the brunt of the work of Association paper writing is done by a comparatively small proportion of the membership is amply shown by the above figures. In the past 25 years the two Associations, each numbering membership in the hundreds, have together held, roughly speaking, about 50 meetings. In all that time, out of 128 men who have been induced to write a paper, 98 have therefrom retired, only 30 of the number appearing twice upon the platform; 35 men, with the spirit of doing their portion of the Association's work, have kept things moving, supplying 152 papers or practically 50 per cent., each writing, not only once but twice and thrice, and some of them even contributing six or eight or ten times. Honor to such workers and members, willing to give their time and knowledge to the Association for their associates' benefit. Honor to Mr. Chollar, who leads, with a record before these two Associations alone of 10 papers, and to Messrs. Egner (8), Clark, Nettleton (7), Gimper, Hyde, G. S. Page, Somerville (6), McMillin, A. E. Forstall, Goodwin, A. C. Humphreys, Love, Lindsley, Mitchell, Shelton (5), Pearson, Ramsdell, Sloane, Smedberg, G. T. Thompson (4), Bredel, Dresser, Dunbar, Edgerton, Farmer, T. Forstall, Greenough, Harper, Jenkins, King, A. S. Miller, Pratt, Sherman and Patton (3), all of whose history, at least in this respect, is above that of their associates.

There are odd bits of interest observable in running through the titles of the papers listed. Observe one by Mr. Taber, 14 years ago, entitled "Gas Stoves a Means of Revenue." Imagine such a theme gravely argued for as novel at present! Note the subject of "Fuel Gas." Ten years ago no Association meeting seemed complete without a paper, tersely headed "Fuel Gas," by some master mind. The papers in the list under that heading, together with the last one by the writer, upon "The Failure of, etc.," come pretty close to constituting a history of that subject in American gas history. Speaking of short titles, it is curious to note how papers upon "Fuel Gas," "Naphthaline," and "Leakage" stick to this commendable brevity of labeling. However, the average is maintained by one of 29 words, that came out of St. Louis, having the comprehensive, not to say terrific, title, "On the Economic Results of an Electric Light Investment, Supplemented by the Author's Views of the Comparative Cost and Value of Coal Gas and Water Gas for Fuel Purposes." This is, in that respect, the Association record, beyond doubt.

All of the above comments are given as they occur, and while occasionally a grain of humor or pleasantry suggests itself in going over the list, the sincere underlying thought is that the work of the Associations in paper writing may be bettered by affording a more convenient chance than heretofore for us all to observe the tendency of the papers, and what has and has not been done or covered by them. To look at the list one would think that every topic possible had been written and rewritten upon, and such assertion is often unthinkingly made. To the writer, however, the reading of the list of papers brings principally the thought of how much has *not* been written upon! A little reflection will show that numerous important and pertinent subjects have *never* been written upon; that others have been but incompletely; that others have been, but so far back as to be as good as new for present purposes, and that others still are far from being brought down to date, or currently covered. In some early succeeding remarks the writer will give a list of upwards of 40 subjects that he thinks will prove these assertions, and possibly be a help to someone who, willing to write, yet "does not know what to write about." Some weaknesses of the present paper-getting system—or lack of it—will also be touched upon, together with a suggestion in the direction of betterment.

Some Notes on the Modern Commercial Gas Engine.

[A paper read by Mr. W. C. PEEBLES, before the North British Association of Gas Managers.]

When asked a few weeks ago to read a paper on gas engines before the North British Association of Gas Managers, I must say I felt great misgivings as to the treatment of such a subject, owing to the short time at my disposal. The numerous papers and lectures which have from time to time been given to the public, through the medium of many learned societies and the press, also make it somewhat difficult to bring forward fresh points of interest. I must crave your indulgence, therefore, while I endeavor to engage your attention for a little on this subject, which is growing in importance day by day; for there can be no doubt that the gas engine is becoming more and more recognized as a standard type of machine for the economical production of motive

power. The simplicity of the modern gas engine brings its management within the scope of individuals of ordinary intelligence, who may not even be connected with engineering matters; and the prejudice which at one time existed against it, and still may exist in the minds of a few, is being gradually overcome. That this is so is well shown by the enormous numbers now manufactured and in use all over the country.

In treating my subject, "Some Notes on the Modern Commercial Gas Engine," I shall, in the first place, recall to your minds very briefly the history of the particular engine which, almost to the exclusion of all other types, holds the supreme position on the market at the present time. I allude to the "Otto cycle" gas engine. One cannot but feel astonished, in looking over the patent records for the last thirty years, to see the extraordinary number of inventions—some of them, seemingly, of the greatest possible merit—which have failed when put to the hard test of practical work. The gas engine patent records are no exception in this respect. Hundreds of patents, representing the work of a multitude of minds, have been laid on the shelf as useless, chiefly owing to the discovery of the "Otto cycle," which made the gas engine a real success, and raised it to the proud position of being a competitor with the steam engine.

The cycle of operations in the Otto engine was first suggested by a French scientist, Beau de Rochas, about the year 1862. At the same time he also pointed out the advantages of compressing the charge before firing. Compression, it is true, had been tried by Barnett in 1838; but the real advantage of it was not properly understood until Beau de Rochas came forward and stated, after much study and investigation, that the conditions necessary for economy in the gas engine were: (1) The largest cylinder volume with the smallest cooling surface. (2) High piston speed, giving rapid expansion. (3) The greatest possible expansion. (4) The highest possible initial pressure before expansion.

The fact that these are the conditions aimed at by manufacturers today shows how well Beau de Rochas understood the true theory. He was, however, too soon with his discovery; and it lay latent for nearly 15 years, during which time little appears to have been done with his suggestions. This was, no doubt, owing to inventors trying to follow on the lines of the steam engine; their endeavors being to produce a gas engine either single or double-acting.

The gas engines then made were of several types—nearly all being atmospheric or non-compression, and giving an explosion at each outstroke of the piston. The most popular was the Otto and Langen, manufactured at Deutz, in Germany. Some of you may have seen these curious engines, with the rack connecting rod, gearing into a clutch pinion on the crankshaft. On the upward movement of the piston, the pinion driven by the connecting rod ran round free; but on the down stroke the clutch engaged with the crankshaft, giving it rotary motion. The explosion merely lifted the piston, which was of great weight, to the top of the cylinder, the latter being vertical. Advantage was then taken of the vacuum produced by the cooling gases, when the pressure of the atmosphere, assisted by the heavy piston, gave the power to drive the engine. The noise and vibration produced were very much against the engine; and its popularity was, no doubt, due to the low gas consumption—about 44 cubic feet per brake horse power per hour—compared with nearly double that quantity used by other engines then made.

While manufacturing the Otto and Langen engines, which were finally brought to a high pitch of perfection, Herr Otto seems to have continued experimenting; and experiments carefully conducted by an earnest worker are certain to bear fruit. He, no doubt, fully realized that the gas engine had a great future before it, and was aware of the necessity of providing a system which would be more reliable, and less noisy, than that used in the Otto and Langen engine. The result of his work was the adoption of the cycle suggested by Beau de Rochas years before, and the production of the excellent Otto silent gas engine. This engine was exhibited at the Paris Exhibition of 1878, and created quite a revolution in the gas engine industry. Messrs. Crossley Bros., of Manchester, secured the patent rights for this country; and through the excellence of their manufactures they soon established the business on a firm footing. Of course, they had practically a monopoly of the whole trade for ten years. Although several other engines appeared during that time, yet, owing to their complicated construction, none of them enjoyed the popularity gained by the Otto engine.

The stimulating effect of the competition set up among makers and inventors was by no means all lost, as many results were obtained by their endeavors, and numerous details were perfected and patented, which put them in a better position for realizing the benefits of the Otto patents when these expired in 1890. At the expiry of these valuable patents, nearly all manufacturers gave up making their own special types of engines, and adopted the Otto cycle—recognizing in it the only really practical cycle for a simple and efficient gas engine.

The great changes which have taken place in the engine since first brought out by Otto are: (1) The method of igniting the charge. (2) The adoption of lift valves in place of the slide valves. (3) The increase of compression.

These all appear exceedingly simple matters; and one is apt to wonder how so many years of constant endeavor and continuous work were required to bring about these changes. Those, however, who have done any original experimental work, and have a knowledge of the intricacies of the gas engine theory, will allow that the great advance made within the course of 25 years or so has been well, and even quickly, brought about.

The slide valve was for years a great hindrance to the development of the engine. High compression was impossible, as the slide had to be pressed so firmly to its seat in order to keep it tight, that great difficulty was experienced in lubricating it properly to prevent tearing. Both manufacturers and users suffered through this evil; and the slide proved a continual source of worry. Its effect upon the economy of the engine was also very considerable, not only through the necessarily cramped port area, and consequent small volume of gas and air admitted at each stroke, but also owing to the heavy drag put upon the engine, as the power absorbed in driving the slide was very considerable.

Compression has been continually on the increase ever since the adoption of the lift valve. In the early days compression ranged between 25 and 30 pounds per square inch, while now the ranges found are generally between 70 and 90 pounds per square inch, depending on the size of the engine. Of course, while stratification of the charge was so much believed in, and considered of such importance in reducing the shock of explosion, the idea of higher compression would, in all probability, have been ridiculed, as high compression and stratification are quite opposed to each other. However, this erroneous theory, and many others held by early inventors, were finally disposed of, and with the introduction of lift valves for the admission of the charge the compression has been increased year by year as other improvements would allow, resulting in greater economy of gas consumed in the engine.

How far compression may ultimately be carried, it is impossible to say. It would seem, however, hardly practicable to increase it further under the present cycle, for the simple reason that all parts of the engine which receive the strain must be designed strong enough to resist the entire shock of the initial pressure of one explosion only. If we could have a compound engine, or even a double acting engine, receiving an impulse at every outstroke and instroke of the piston, almost any pressure could be dealt with, without the engine becoming unduly large for the power given out. At present the initial pressure rises as high sometimes as 320 pounds per square inch; and although this is only for an instant, and occurs but once in every four strokes, yet the engine must be strong enough to resist that pressure, and excessively heavy flywheels are required to keep the speed constant during the idle strokes.

This increase of compression has more to do with the economy of the modern gas engine than possibly any other change—firstly, by reduction in the size of the compression space wherein the burned products may lodge at the end of the exhaust stroke; and, secondly, by the more intimate and closer mixing of the particles of gas and air, thereby insuring a more complete and instantaneous explosion. The highest temperature of the explosion being reached more rapidly owing to the higher compression, it is not so greatly affected by the cooling action of the cylinder, as the cylinder surface is not much exposed until the piston has moved a little forward; and by that time the bulk of the power contained in the gas has been given to the engine.

Mr. Dugald Clark, in his excellent work on "The Gas and Oil Engine," gives some tests showing the result of increased compression on a Stockport gas engine, as manufactured by Messrs. J. E. H. Andrew & Co., Limited, of Reddish. The engine tested was altered by fitting on compression chambers of different capacities. It gave, with 60 pounds compression, 20.8 brake horse power on a gas consumption of 22.3 cubic feet per brake horse power per hour; while with 90 pounds compression the brake horse power rose to 24.4, and the gas consumption decreased to 20.75 cubic feet per brake horse power per hour. This is an increase of 17 per cent. in power, and a decrease of 8 per cent. in gas consumption.

From the earliest date down to the present day the ignition of the charge has been a continual source of trouble; and there are many engines, even of recent manufacture, which give annoyance in this re-

spect. The difficulties connected with the ignition of the charge have not easily been overcome. Being such an important factor in the economical working of an engine, there is little wonder that so much care has been bestowed upon the igniting arrangements. Of course, the ignition is the life of the engine—the vital spark, so to speak, which transforms the charge of gas and air into the power which is given out through crank and flywheel. When watching any good modern engine at work, fitted with tube ignition and timing valves, one is apt to imagine the whole thing very simple. But the fact is, the igniting arrangements have had to pass through many changes before being brought to their present state of perfection.

So long as the engines were of the non-compression type the charge was easily fired by an external flame, which was sucked into the explosive mixture when the slightest vacuum was formed in the cylinder. We all know—some of us from actual experience, through the wrecking of houses, gasholders, governors and meters—how easily a mixture of gas and air at atmospheric pressure is exploded; in fact, special precautions have to be taken to prevent accidents on this account. But compression at once changes these conditions. A flame applied to the orifice of a vessel containing an explosive mixture under pressure has no tendency to run in, but burns fiercely at the outlet of the cylinder or other vessel from which the explosive mixture is being forced.

Some arrangement had, therefore, to be got which would fire the charge inside the engine cylinder, notwithstanding the compression. Perhaps the simplest flame-igniting device which would do this was that of Barnett, brought out as far back as the year 1838. It consisted of a stopcock, having a hollow plug, in which was placed a small gas jet. The plug had a long narrow port in one side of it, running lengthwise; and this port, when the plug was in one position, communicated with the air through a similar port in the barrel or shell. Here the jet was lighted by an outside flame, and at the proper moment (determined by mechanism connected with a moving part of the engine) the plug was turned through a quarter of a circle, when its port came opposite a port communicating with the cylinder, and fired the charge. This extinguished the jet, but it was relighted on the plug being turned back to its original position.

Otto's improvement in the firing of the charge consisted of a simple arrangement of a cavity and ports in the slide valve, whereby he obtained a flame under pressure. This was brought about by admitting to the cavity in which the ignition jet burned a small portion of the explosive mixture from the cylinder, which gradually raised the pressure of the flame to that of the compressed charge. This arrangement was in use for many years, although not always quite satisfactory, especially at high speeds and full power loads, as great difficulty was experienced in ventilating the small passages and cavity in which the jet had to burn. When we consider that ignition had to take place as often as 100 to 150 times a minute, according to the speed and load on the engine, we may admit that the clearing out of these small passages so rapidly was no easy matter.

The electric spark has also had its share of the inventor's attention; and many valuable arrangements have been brought out. They are all, however, dependent upon a battery and induction coil, and the electrodes exposed to the explosion are so liable to corrode—thereby causing much trouble—that this system has not come into general use in this country, at least. It has, of course, its good points, which, in certain cases, are well worth the extra trouble involved in keeping the several parts in proper working order.

It was as a great boon, therefore, that the hot tube came to assist the gas engine one step further forward; and many are the improvements connected with even such a simple part of the engine as the ignition tube. The first tubes were made from ordinary ¼-inch bore iron gas pipes, either welded or closed by a cap at one end, the other end being screwed into the cylinder or some part communicating with it. So long as they are new, iron tubes give a good, reliable form of ignition, and are still largely used. Owing, however, to the action of the continued heat, the composition of the gas, and the pressure of the explosion on the inside, they soon get choked up by a deposition of carbon. The iron becomes quite thick and brittle, and when fractured it shows quite a crystalline appearance.

All sorts of alloys have been made and used for the manufacture of ignition tubes, in the endeavor to get some metal that would heat easily, keep clean internally, withstand compression, and have lasting qualities. The points have not been attained with metal tubes, as they have to be made so thick that they are difficult to heat, and it takes a large amount of gas to keep them hot.

The use of porcelain for tubes was first tried by Watson in 1881, and has since been proved to be the best material for the purpose. The tubes have a drawback, certainly, in that they require more careful handling than metal tubes; but, once connected to the engine, and the joints made tight, they work admirably—tubes, after use for years, when taken out, being perfectly clean and apparently unchanged in any way.

The ignition valve is, in my opinion, a most important feature in the modern engine. Many engines are still made which have the firing tube continually open to the cylinder; and the moment for explosion is timed by raising or lowering the Bunsen flame, so that the tube is heated higher up or lower down, as desired. With absolutely unchanged conditions, during the whole life of an engine, this method of regulation would, perhaps, be perfect. The burned gas and air left in the tube, if compressed to exactly the same extent each compression stroke, determines the position in the firing tube to which the fresh explosive mixture will be forced; and if the heated portion of the tube is properly adjusted, ignition will not take place until the full compression has been reached—that is, when the piston is full in, and the crank just passing the dead point.

You will readily see, however, that we have many circumstances to deal with before we can insure absolutely constant conditions. The compression which we depend upon to force the fresh charge up to the same height in the tube every time, may not (owing to the speed of the engine or to a leaky piston or valves) be always sufficient. Then the tube, unless made of some incombustible and incorridible substance, will change its character and size. And, lastly, the continual varying conditions of pressure in the gas mains will slightly alter the proportion of the charge, and possibly affect the Bunsen flame, and therefore the heat of the tube.

With a timing valve, we at once get rid of nearly all these difficulties. The distance from the cylinder to the tube can be made exceedingly short, so as to insure that even the most variable charge will reach the heated portion; and early firing is prevented by the timing valve, which is opened mechanically as the crank passes the dead center. Besides, nearly all gas engines are now fitted with an adjustable governor, so that the speed of the engine may be altered while running. If there is no timing valve, the economy of the engine, should the speed be much altered from the normal, may be seriously affected; a higher speed causing early firing and knocking of the piston and connecting rod, while a lower speed may cause slow firing and even miss fires.

I regret that, owing to building operations for the extension of our works, I have been unable to prepare any special tests to lay before you, as our testing arrangements have all been upset. However, as there have been recently many exhaustive tests made and published by some of the highest authorities on the gas engine, I do not think you will miss anything I could have given you, meantime, in this way.

With your permission, I should like briefly to refer to some of the improvements, chiefly connected with details, which my own firm have introduced. Our engine is of the usual Otto type, and is designed specially to render it as simple and reliable as possible. The explosion chamber at the end of the cylinder, into which the charge is compressed, has had our greatest attention, and we have tried many different shapes. The design we have at last adopted for this part is in the shape of a cylindrical cone. The base of the cone is next to, and of slightly larger diameter than the cylinder, which gives the necessary clearance for the end of the piston. The length is regulated by what is required to admit the exhaust valve, while the small end of the cone depends on the space necessary for the amount of compression required. In this way we get as large and open a space as possible, so that the explosion is not choked or cramped. The whole charge also is confined in one space, there being practically no ports or passages in which the burnt products may lodge. The inlet valve for admitting the charge is placed directly behind the exhaust valve on the center line of the cylinder; and it opens into a short cavity, the front of which freely communicates with the compression space, while at the back of the cavity is a small short hole leading to the ignition tube. The gas enters from the gas valve, and, mingling with the inrushing air, both pass through the inlet valve into the compression space, clearing out the cavity and tending to suck the burnt products of a previous explosion from the ignition tube.

The other points I would draw your attention to, and which, I believe, are quite novel, are the cylinder oiler, the ignition tube, the timing valve and the crosshead bearings in small engines. You will notice in the oiler (Fig. 1) your old friend the semi-cylindrical float, used by Sanders & Donovan for their wet gas meters. The importance of absolutely constant oiling for the cylinder cannot be overrated, as the high temperature of the flame of the explosion soon burns off the thin

film of oil on the surface of the cylinder; and if this is not continually renewed, cutting of the cylinder at once takes place. The float in this vessel keeps the oil always at the same height, so that the small rotating spoon, driven slowly round by the engine, receives exactly the same

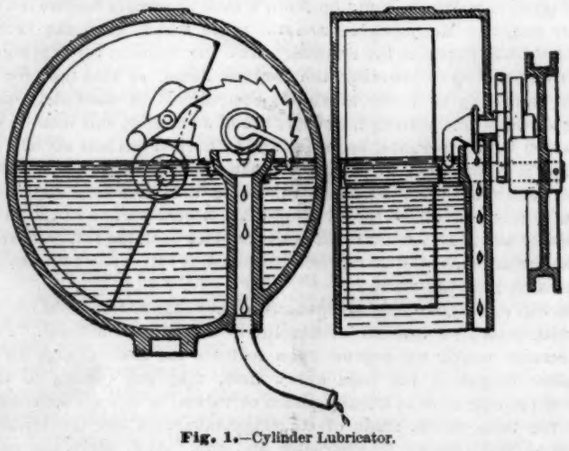

Fig. 1.—Cylinder Lubricator.

amount of oil at each revolution, and this continues during the whole time the engine is running.

The ignition valve (Fig. 2) consists of a straight steel spindle, about ¼ inch diameter, which closes and opens the passage from the cylinder to the ignition tube, when moved to and fro by a lever through a cam on the side shaft. It is sometimes astonishing what a small trifle prevents the regular firing of the charge; the least increase or reduction in the size of the ignition hole being sufficient to cause the charge to miss fire. The form of this valve allows of a perfectly straight hole from the cylinder to the tube, which is very important, as any bends or elbows are not conducive to sharp instantaneous firing. The valve is very loosely fitted, and just crosses the hole from the cylinder to the tube. During compression the small portion of the fresh mixture, which passes the valve owing to it not being quite tight, gradually drives out the products of the previous explosion into a chamber in the ignition tube holder. The valve rod works easily in a long gun metal gland; and, to prevent leakage, it has a double faced valve turned

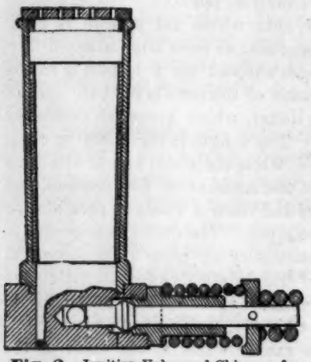

Fig. 2.—Ignition Valve and Chimney for Bunsen Burner.

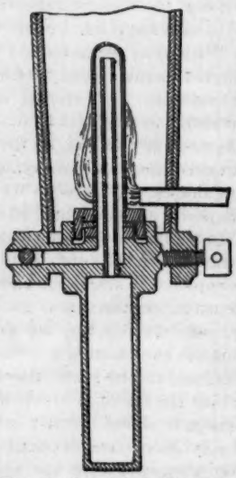

Fig. 3.—Porcelain Ignition Tube and Holder.

upon it. The valve rod is pushed in—not directly by the lever, but by means of a strong spring; and the inner valve face prevents leakage during compression. At the moment of explosion the cam on the side shaft releases the lever, and the spring is withdrawn; while another spring comes into play and pushes back the valve rod, closing the other valve face upon its seat. This valve works well and gives no trouble. One has been in constant use in one of our engines for over three years; and, to my knowledge, it has not been taken out for any repairs or adjustment.

The ignition tube (Fig. 3) we have adopted is made of porcelain. It is unusually short, closed at one end, and the open end has a flange formed on its outside, by which a hollow nut secures it in position, in a specially constructed holder. A small metallic tube extends from the holder inside and almost to the top of the porcelain tube; so that the burned products of a previous explosion pass down this small tube into a chamber at the bottom of the holder, which allows the fresh charge to reach the heated porcelain. The small metal tube does not undergo any change, as it is never red hot, and the pressure on it is equal both

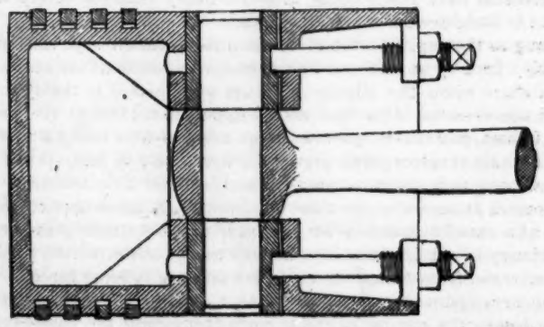

Fig. 4.—Piston of Small Engine, Showing Method of Taking Up Wear at Crosshead.

outside and inside. This ignition tube has given great satisfaction; the ignition is most reliable, taking place with certainty at either fast or slow speed.

The difficulty of fitting small engines with adjustable brasses for the end of the connecting rod in the piston is so great, on account of the small space available, that many engines are made without this provision at all. Consequently, when the least wear of the crosshead pin takes place, the only remedy is to fit in a new pin. To avoid this we have reversed the order of things, by placing the adjustable brasses in the piston (Fig. 4), fixing the pin so that it turns with the rod. By this means, although a little costly at first, the smallest engine can be adjusted when wear takes place at the crosshead pin.

There can be no doubt that a great deal has yet to be done to improve the action of the gas engine. The main direction in which a change must be looked for is, I think, in the cycle. But this would seem almost impossible without introducing complicated mechanism. At present—at least with the smaller sizes—the successful competition of the gas engine with the steam engine is chiefly due to the convenience and economy with which the gas engine can be operated, especially for intermittent work. With engines above 40 or 50-horse power, using producer gas, the cost of working, as compared with steam, is very greatly in favor of the gas engine, as has been proved time after time. We shall find, therefore, that the large gas engines will not stop at 400 or 500-horse power, but increase gradually year by year, until they compete in power with the largest steam engines made.

What the gas engine has done for the benefit of small masters it is impossible to estimate. Many hundreds of these employers were driven out of existence by the introduction of the steam engine. But they are gradually springing up again; and, by the aid of the gas engine, they are able to secure a respectable share of trade. That the gas engine will rank in the near future as one of the chief sources of power there can be no doubt; and I would add, in closing, that as gas managers are chiefly concerned in the manufacture of the working fluid, they should do all in their power—by giving a plentiful supply, at a good pressure, and, if possible, at a reduced rate—to help forward this excellent motor to a greater extent of usefulness.

The Electric Meter's Relation to the Dividend.

[From a paper read by Mr. Caryl D. Haskins, before the Ohio Electric Light Association.]

The meter's relation to the dividend is partly, of course, a very obvious relation, but I have been surprised in going from plant to plant and from place to place to find how many central stations throughout the country have overlooked the fact that in the mere matter of the careful disposition and management of meters lies all of the difference between financial success and failure.

A good many central stations in the past have confined themselves to the question of accuracy on what they deemed would be the average load of the meter. While no doubt that test is better than none, it really means very little. The next step has been the testing of the

meter to see on what load it will start. The load on which a meter will start to rotate is of almost no importance. A meter may start on 2 per cent. of its rated capacity, and yet may be running 90 per cent. slow, and is not as good a meter as the one which won't start until it gets within 3 or 4 per cent. of its rated capacity, but when once started will run with approximate accuracy.

I have come to appreciate that the most important thing of all to look for, the thing which will make the treasurer look happiest at the end of the year, is the proper action on overload. A great error that central station managements have made in the past is the use of meters too big for the work. If a meter is used which is good on overloads, and is accurate until it burns up, phenomenal accuracy on low loads is not essential. The meter which is extremely accurate on low loads is not to-day a hard meter to find, but a rather hard meter to maintain. The low load is the load that friction, dust, dirt, wear and age affect; and what is wanted to day in every installation is that meter which will carry the load, frequently working on an overload perhaps, and seldom working on a very low load.

When possible it is a good thing to avoid working meters at much less than 10 per cent. of their rated capacity. Of course this is not always possible; but more often possible than one would think at first sight, or upon hasty investigation. I admit that next in importance to overload accuracy in a meter comes the light load accuracy; for the simple reason that light loads cannot always be avoided.

The third feature to investigate with care is the inductive load accuracy.

These three factors are perhaps being looked into pretty carefully now by 75 per cent. of our stations. Almost every station, however, stops at that point. Very few stations investigate accuracy on changes of frequency, accuracy on changes of wave form. Almost everyone has to face a change in frequency sooner or later; and the bulk of meters to day are weak at that point. A meter which must be changed if the frequency of the system is altered, or a meter which cannot be changed from a 60-cycle machine to a 125-cycle machine, or vice versa, is not a profitable piece of apparatus to have, and ought to be avoided. The wave form question is one which has not been appreciated very long; but obviously it is not a good thing to have meters which will run within 1 per cent. of accuracy on a smooth core armature and a different percentage on a tooth core armature; yet many meters vary materially between these conditions.

I have placed all of these technical considerations before another, which perhaps has also been passed over too lightly in the past; and that is the mechanical construction of the meter and its ability to withstand punishment. I can class with that portion of the treatment of the subject the question of damping magnets. The speed of the meter changes as the square of any change in the damping magnet strength; in other words, a slight change in the strength of the damping magnet will change the speed of the meter as the square of that change in the magnet. That emphasizes immediately the importance of having really permanent damping magnets. If they are exposed to unusually high or fluctuating temperatures, as in an attic under a tin roof, their strength falls, as it does also under severe vibration.

The jewel is also a point which should be looked into with care. Sapphire jewels are the commonest bearing to-day. The sapphire is really the only substance which is fit for a meter bearing; it is next to the diamond in hardness, and yet is peculiarly smooth on its polished surface, and in that respect differs from diamond, which is apt to be gritty and rough. The sapphire which comes from Arizona is not more than one-half as hard as the sapphire which comes from Ceylon.

Generally speaking, lighter colored and whiter sapphires make the best bearings. A rigid mount is not the best for jewels, since they are worn away not so much by the rotation of the shaft as by its reciprocating motion. Imperceptible though it may be, it is always there; and it is this hammering motion which breaks up the surface of the jewel and establishes that gritty foundation which means death to the bearing. The moment the outer skin of the polish on a jewel is broken the jewel is on the road to destruction.

Low speed is much better than high for a meter. A jewel will wear a good deal longer proportionately on a low speed than a fast; in other words, the jewel which will wear on an average 2,000,000 revolutions at a speed of 40 revolutions per minute will not wear for 2,000,000 revolutions at a speed two or three times greater. About 2,000,000 revolutions is the life that can be looked for from a good grade of sapphire meter jewel. This is true unless the meter is placed in position where there is a good deal of vibration, when it will have a shorter life. A good, rigid point of installation in a basement, with no moving machinery, will show more; yet 2,000,000 is a fair average.

This leads me to the question of the installation of the meter. Many central station managers will take out and test their meters with the greatest of care, and use expert knowledge in determining what is the best meter to meet their conditions and yet sacrifice from 1 to 2 per cent. of their stockholders' money annually on the altar of improper installation. As I said before, most meters are too large for their work. It is better to put in too small a meter, even if one is occasionally lost by a burn-out, than it is to put in one big enough for the maximum load, and lose revenue constantly on minimum loads.

It is, of course, a greater loss to have a meter running an hour on 100 lamps at a speed of one-half of 1 per cent. slow than it is to have that same meter run for an hour on one lamp 25 per cent. slow. The accuracy an overloads, therefore, must be greater than that on the light loads. This is a point that is often missed. A good many people think that 5 per cent. is 5 per cent., forgetting that while 5 per cent. may not be at all serious on light load, it is death to dividends on high load or an overload.

In installing meters in theaters, hotels, and big installations generally, there has been in the past a very common error made in putting in only one meter. When that is done a lot of revenue is lost, owing to the theater corridor or office lights, which are burning when the bulk of the house is idle. If the meter is big enough to carry the whole theater or hotel installation on an ordinary overload, when ten, twelve or even twenty lights are run on that meter for a good many hours a day, a considerable percentage of that proportionately light load is lost. In all installations of that kind—theaters, hotels, halls—it is well to split up the circuits.

In installing meters avoid vibration. I have been in office buildings where every meter in the building was on a wooden partition, and where 50 per cent. of them were on partitions with banging doors. That means death to the jewels. It destroys light-load accuracy, because the jewels speedily become rough. If the meter has brushes it causes sparking at the commutator, which in turn increases the friction.

Considerable sacrifices in the wiring are justified to secure a suitable point of installation for the meter. A brick wall is good; the nearer the foundation the better. All kinds of pounding should be avoided, especially the vibration from moving machinery, which is the worst form of vibration to which a meter can be exposed. The price of a jewel is a small matter as compared with the loss which the company has to undergo from running meters on rough jewels. Much energy cannot be spared to make the meter a high-torque device, and friction must of necessity always be a considerable portion of the load which the meter carries in the work it does. This can be doubled, trebled or quadrupled by leaving a rough jewel beneath the lower bearing.

Places subject to high temperatures, or to sudden changes of temperature, ought to be avoided. Like very hard glass, jewels are liable to crack and break and flaw when the temperature changes; and it is probable that meters installed in garrets where the temperatures sometimes go as low as zero, and again as high as 100°, will not show anything like the accuracy at the end of a year as will meters installed in situations where the temperature seldom goes below freezing point or rises above 90°. Again, the places where the temperature is constantly high are dangerous and hurtful, because by just so much do they lower the ability of your meter to carry overloads.

(To be Concluded.)

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. J. Fred. Seamon, General Manager of the United Light Company, of Uniontown, Pa., has been appointed Manager of the Brownsville (Pa.) illuminating gas plant. He took charge of the Brownsville works on the 1st inst. Mr. Seamon thoroughly understands his business and will no doubt instill new life in the affairs of the Brownsville Company, for it is quite sure he will see to it that every detail of its trading is looked after. Mr. Albright will remain with the Company as Superintendent, of course under the direction of Mr. Seamon. The latter will, it should be said, not sever his connection with the United Light Company, and will retain his residence in Uniontown.

The capital stock of the Newport (R. I.) Gas Light Company has been increased in the sum of 60 per cent. The increase was made in the shape of a stock dividend.

A correspondent, writing under date of September 2nd, says: "The residents of Bath, Maine, were much surprised and grieved to hear, on the afternoon of August 30th, that Mr. Galen C. Moses, one

of Bath's best known citizens, had assigned to Messrs. Symonds, Snow & Cook, of Portland, Maine, for the benefit of his creditors. The assignment was caused by the financial straits of the Bath Gas and Electric Company, and the Richards Paper Company, of South Gardiner, with which he is closely connected, and the paper of which he had endorsed in large amount. Both of the named corporations also made an assignment, the former to Messrs. Howard & Spear, Charles McLellan and C. C. Low, of Bath; and the latter to Weston Lewis and Melvin Halloway, of Gardiner. No amounts were named in the original assignment of papers, but it is understood that they are by no means small. The Bath Gas and Electric Company had been at much expense this year in enlarging its plant, and its failure to meet the maturing obligations caused the crash. The Richards Paper Company had been behind financially for some time. We all regret very much the misfortune that has overtaken Mr. Moses, and the hope is universal that he will speedily retrieve his losses.—H."

On the afternoon of August 31st, in response to a call issued by the Mayor of Dallas, Texas (Mr. John H. Traylor), the Common Council assembled in executive session for the purpose of considering the proposed gas ordinance, but no final action was taken thereon. The city submitted a proposition to the Dallas Gas and Fuel Company and the Company submitted a proposition to the city, but there was so wide a difference in the terms of each that much negotiation will have to be carried on before an agreement can be reached. It is understood that the city is willing to grant a new franchise to the Company, provided the latter will reduce its selling rates to $1.25 per 1,000 cubic feet on illuminating account, and to $1 per 1,000 cubic feet on fuel account. Further, the Company is to pay into the city treasury the sum of $2,500 per annum as a franchise tax. This agreement is to run for 10 years. For the second period of 10 years the city asks that the selling rates be lowered to $1 on lighting account, and to 80 cents on fuel account, and that the franchise tax be increased to $3,500 per annum. The Company's proposition is not known to us, but it must differ vastly from that outlined here, for under its terms the Company could not possibly pay even its operating expenses.

One fair looking result of the conference was the appointment of a Committee to examine the books of the Company, with a view to determining just what profit its business, at the present rates charged, yields.

The proprietors of the Hazelton Boiler Company, of this city, report a most satisfactory trade in their well-known and economical steam raising apparatus. Perhaps the following transcripts from their order book will best show what the Company's proprietors are doing: 500-horse power, for the Morris County Electric Company, of Morristown, N. J.; 750-horse power for the Brookline (Mass.) Gas Light Company; 200-horse power for the American Gas Company's plant at Port Chester, N. Y.—this in addition to 3 boilers of the same type; 300-horse power (5th boiler of same type), for the Newark (N. J.) Gas Company; 800-horse power for the Olcott Falls Company, Wilder, Vt.—third order; 500 horse power for the Rochester (N. Y.) Gas and Electric Company—10th order, making 4,500-horse power of these boilers in that very complete plant. The Rochester Company has also recently purchased a 500-horse power Hazelton or "Porcupine" boiler from the Syracuse (N. Y.) Heat and Power Company, which will shortly be re-erected in the electric department of the Rochester Company. A new steel jacket for the 200-horse power Hazelton boiler, erected about 10 years ago by the Oakland (Cal.) Gas, Light and Heat Company, and now to be equipped with all the latest improvements; the Wagner Palace Car Company, Buffalo, N. Y., steel jackets for five 150 horse power Hazelton boilers, which were erected in circular brick settings about eight years ago; the Gilbert & Bennett Manufacturing Company, steel furnace casings for two 500-horse power Hazelton boilers in its plant at Wireton, Ills.; Messrs. Bartlett, Hayward & Co., of Baltimore, 100-horse power for the gas works plant at Jamaica, L. I.; Goodyear India-rubber Glove Manufacturing Company, Naugatuck, Conn., 300-horse power—third order; South Middlesex Street Railway Company, South Framingham, Mass., 150-horse power—third order; Messrs. Wm. P. Youngs & Bros., planing mill, N. Y. city, 100-horse power; Messrs. Zahn & Bowly, 50-horse power for their factory at Rutherford, N. J. All of these boilers are to be equipped with the new brick-lined steel jacket with square furnace and square grate surface recently introduced by the Hazelton Boiler Company. The Company has a number of men engaged in erecting boilers in different parts of the country, the sales of which boilers were announced in the Journal at the times they were effected. Such a list of orders clearly indicates the esteem in which the Hazelton boiler is held by intelligent and up-to-date steam raisers.

The public lighting of Hastings, Neb., for the ensuing five years, will be carried on by means of arc lights and gas lamps. The rates agreed on are: For arc lights, $7 per month each; gas lamps, $17.25 each per annum. A moontable is to be followed.

Manager Copley, of the Aurora (Ills.) Company, is now ready to receive the public and his friends in the Company's handsome, new offices, 36 Fox street, Linden block. The situation named is in the heart of the business district of Aurora.

We regret to announce the death of Mr. George Shunk, of the Fairfield (Iowa) Gas and Electric Light Company.

The municipal electric lighting plant at Riverside, Cal., is not meeting with much favor from the residents. In fact, the service has been so wretched, both in point of price and inadequate lighting, that scores of the residents have returned to the use of gas.

Mr. William F. Whitmore has given up the agency for the Welsbach Light Company in Hartford, Conn.

A syndicate, represented by Mr. Samuel R. Bullock, of Philadelphia, has purchased the plants of the Fostoria (O.) Light and Power Company and the Northwestern Natural Gas Company. It is said he proposes to construct a plant in the southern section of the city, from which will be delivered gas for fuel and illuminating use, and electric currents for illuminating and power service, the electric power supply to be directed mainly to the operation of a street car line.

The sale of the Quincy (Ills.) Gas Light and Coke Company and of Thomson-Houston Electric Light and Power Company is announced. The purchasers are Maine and New Hampshire capitalists, the principal in the transaction being Mr. J. Manchester Haines, of Augusta, Maine. The price said to have been paid is $460,000, but of this we have no accurate knowledge. It is likely that Mr. Wm. E. Steinwedell will be retained as Superintendent of the gas division of Mr. Haines enterprise.

The Omaha (Neb.) Gas Company has accepted all the provisions of the franchise recently granted to it to supply gas in South Omaha.

Secretary and Treasurer Grant, of the Waukegan (Ills.) Gas Light and Fuel Company, says that the works will be in operation by November 1st.

An explosion a few days ago in the purifying house of the 21st station of the Consolidated Gas Company, N. Y., caused considerable damage.

A man named William Bonner, who keeps a restaurant No. 115 East Harrison street, Chicago, says that the installation of a prepayment meter, which replaced a meter of the ordinary type, has had the effect of reducing his gas account to the tune of 66 per cent. Possibly!

The residents of Essex county, Canada, are agitating anew the matter of the passage of a law prohibiting the exportation of natural gas from Canada to the United States.

The Market for Gas Securities.

Indecision, doubt and dullness were the ruling characteristics of the market for city gas shares last week. This was particularly so in the instance of Consolidated, which opened to-day (Friday) at 187½ to 188. New Amsterdam common is nominally 29 to 29½, the preferred being quoted at 69¾ to 70½. Mutual, however, remained steady, even showing towards the close some strength. The competition for business between the Consolidated and New Amsterdam Companies is still on, but the contest seems to be carried on in a faint-hearted sort of way. It is the impression in well-informed circles that this war for trade will be of short duration.

Brooklyn Union holds steady, as does Peoples, of Chicago. The impression prevails, though, that the short interest in the latter has been pretty well covered. Buffalo gas, on the intimation that the situation there all tends to a complete harmonizing of interests, is in demand, at 23 to 24. Consolidated, of Baltimore, shows no change, while Bay State is again below the 3½ mark.

Gas Stocks.

Quotations by Frederic B. Cochran & Co., Brokers and Dealers in Gas Stocks.

20 and 22 Broad Street, New York City.

Sept. 12.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$36,230,000	100	187½	188
Cental Union, Bonds, 5's	3,000,000	1,000	103¼	104
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	.	108	112
Mutual	3,500,000	100	327	335
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co.	13,000,000	100	29	29¼
Preferred	10,000,000	100	69¾	70½
Bonds, 5's	11,000,000	1,000	101	101½
Northern Union, Bonds, 5's	1,250,000	1,000	94½	95½
New York and East River,				
Bonds 1st 5's	3,500,000	1,000	111	113
" 1st Con. 5's	1,500,000		107½	108½
Richmond Co., S. I.	348,650	50	70	.
" Bonds	100,000	1,000		
Standard	5,000,000	100	130	140
Preferred	5,000,000	100	157	165
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	126½	128
" " Bonds (5's)	15 000,000	1,000	115	115¼
Bay State	50,000,000	50	3¼	3½
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works,	450,000	100	..	..
" 1st Mtg. 5's	450,000	1,000	..	..
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	..	80
Buffalo City Gas Co.	5,500,000	100	23	24
" " Bonds, 5's	5,250,000	1,000	95½	96
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	89	91
1st Mortgage	1,207,000	1,000	101	103½
Consumers, Jersey City	2,000,000	100	78	85
" Bonds	600,000	1,000	101½	103½
Cincinnati G. & C. Co.	8,500,000	100	205½	206¾
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	
Consolidated, Baltimore	11,000,000	100	..	65¾
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000		..	..
Consolidated Gas Co. of N.J.	1,000,000	100	16	21
" Con. Mtg. 5's	380,000	1,000	75	80
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,500,000	50	61	..
" Prior Lien 5's	4,538,000	1,000	94¼	94½
Detroit Gas Co., 5's	428,000	1,000	..	..
" Inc. 5's	34,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	75	80
" Bonds	2,000,000	..	88	
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	115	125
" Bonds, 6's	2 650,000	..	106	107
Jackson Gas Co	200,000	50	..	..
" 1st Mtg. 5's	250,000	1,000	..	..
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	78	83
Bonds	1,000,000	1,000	90	91
Louisville	2,570,000	50	.	..
Laclede, St. Louis	7,500,000	100	50	50½
Preferred	2,500,000	100	93	95
Bonds	10,000,000	1,000	105	105¼
Madison Gas & Elec. Co.	400,000	100	..	..
" " 1st Mtg. 6's	350,000	1,000	..	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	252	..
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	52	53
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	105⅝	105¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10.000,000	100	85⅝	86
St. Paul Gas Light Co.	1,500,000	100	49	51
1st Mortgage 6's	650,000	1,000	84	87
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co	1,000,000	100	..	..
" 1st Mtg. 5's	750,000	1,000	..	..
Syracuse, N. Y.	1,750,000	100	17	18
Bonds	1,500,000	1,000	94	97
Washington, D. C	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	85½	86
Bonds, 5's	3,556,000	.	101¾	102½
Wilmington, Del.	850,000		204	206

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DIVIDEND NOTICE.

OFFICE OF WELSBACH LIGHT CO.,
DREXEL BUILDING, PHILA., Sept. 7, 1898.

The Directors have this day declared a dividend of One Dollar per share, payable September 19, 1898, to stockholders of record at the close of business September 12th. Checks will be mailed.

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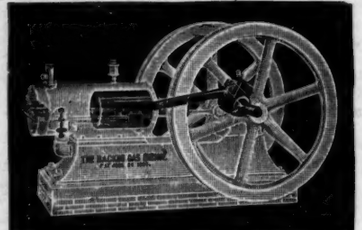

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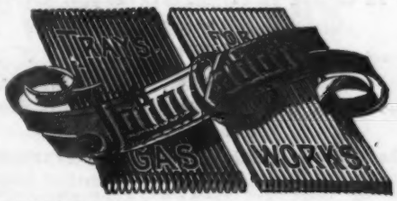

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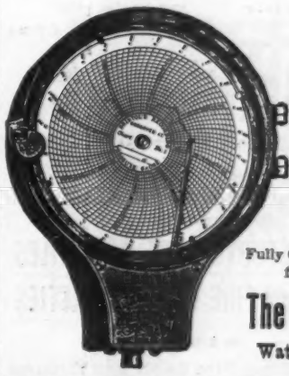

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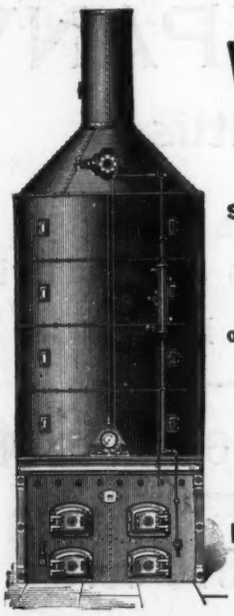

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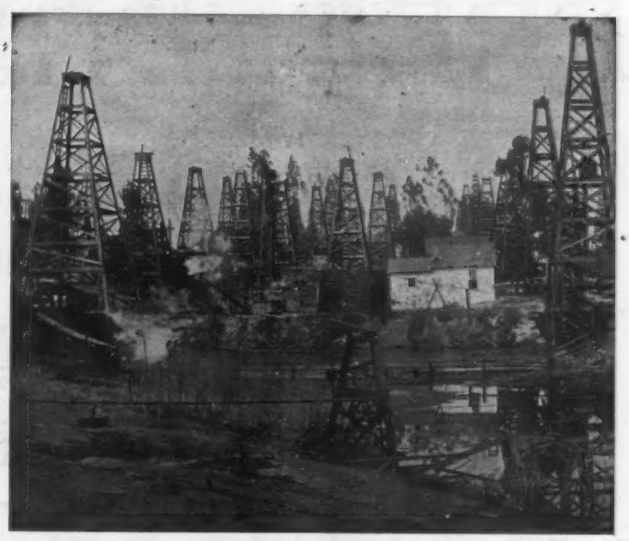

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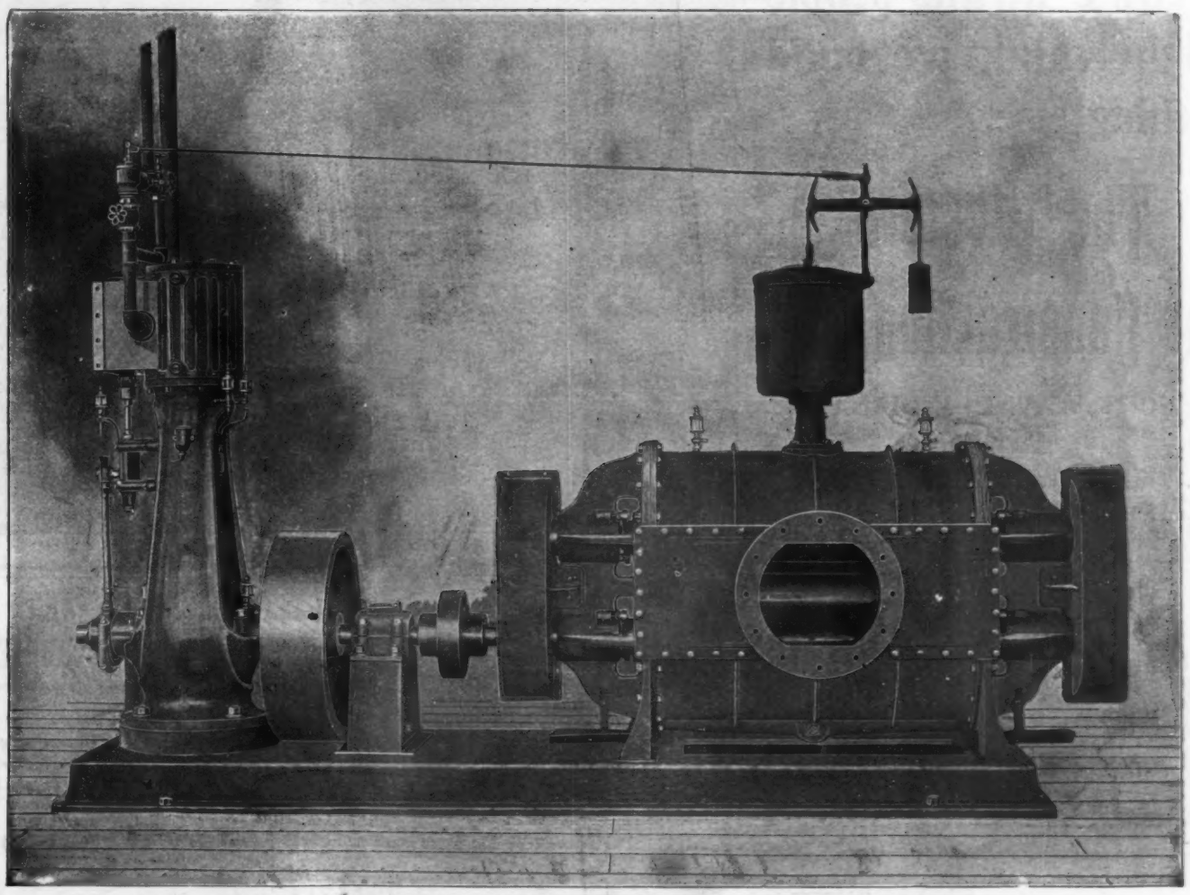

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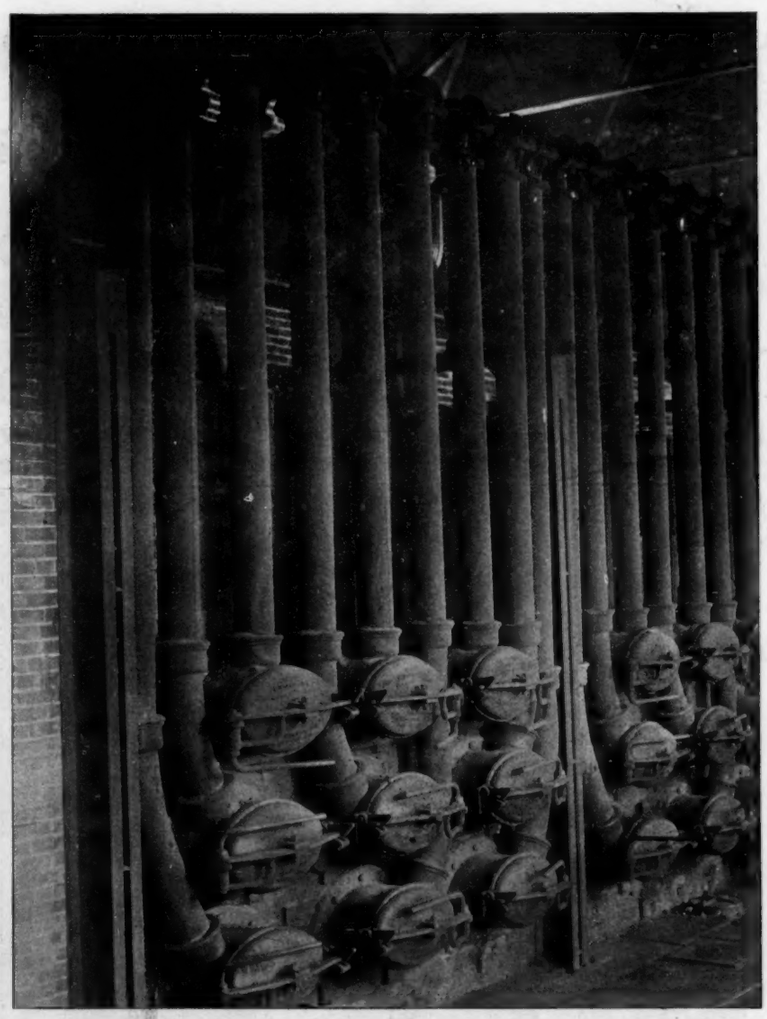

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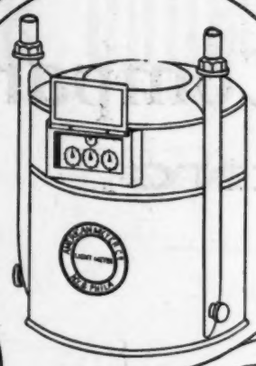
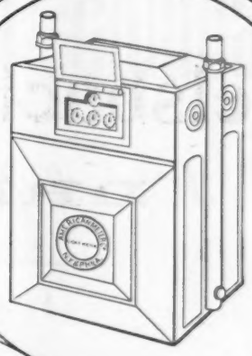
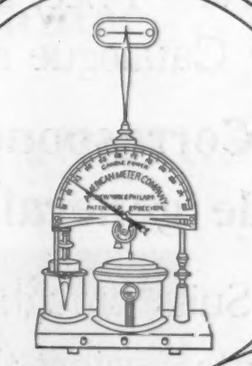


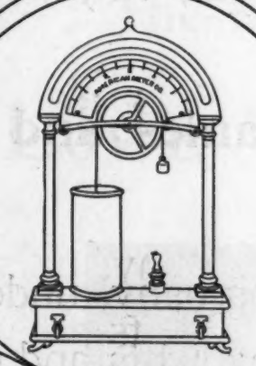


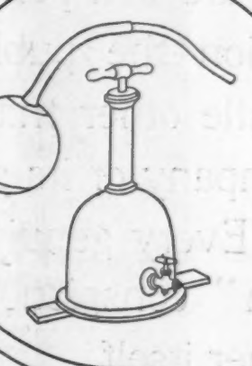
PUBLIC LIGHTING TABLE.

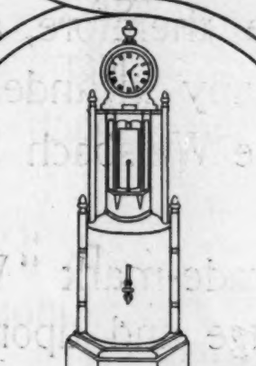
SEPTEMBER, 1898.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguist.
				P.M.	A.M.
Thu.	1	No L.	No L.	6.30	4.20
Fri.	2	7.00 PM	8.20 PM	6.30	4.20
Sat.	3	7.00	8.50	6.15	4.30
Sun.	4	6.50	9.20	6.15	4.30
Mon.	5	6.50	9.50	6.15	4 30
Tue.	6	6.50	10.30	6.15	4.30
Wed.	7	6.50 LQ	11.20	6.15	4.30
Thu.	8	6.50	12.10 AM	6.15	4.30
Fri.	9	6.50	1.10	6.15	4.30
Sat.	10	6.50	2.10	6.05	4.40
Sun.	11	6.40	3.10	6.05	4.40
Mon.	12	6.40	4.40	6.05	4.40
Tue.	13	6.40	4.40	6.05	4.40
Wed.	14	6.40	4.40	6.05	4.40
Thu.	15	6.40 NM	4.40	6.05	4.40
Fri.	16	6.40	4.40	6.05	4.40
Sat.	17	6.40	4.40	5.55	4.50
Sun.	18	6.30	4.50	5.55	4.50
Mon.	19	6.30	4.50	5.55	4.50
Tue.	20	7.30	4.50	5 55	4.50
Wed.	21	8.20	4.50	5.55	4.50
Thu.	22	9.20 FQ	4.50	5.55	4.50
Fri.	23	10.30	4.50	5.55	4.50
Sat.	24	11.40	4.50	5.40	5.00
Sun.	25	1.00 AM	4.50	5.40	5.00
Mon.	26	2.10	4.50	5.40	5.00
Tue.	27	3.20	4.50	5.40	5.00
Wed.	28	No L.	No L.	5.40	5.00
Thu,	29	No L. FM	No L.	5.40	5.00
Fri.	30	No L.	No L.	5.40	5.00



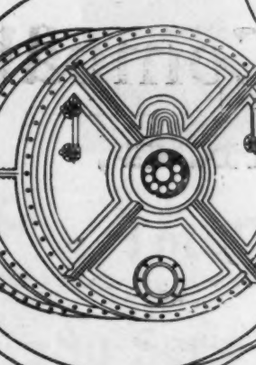


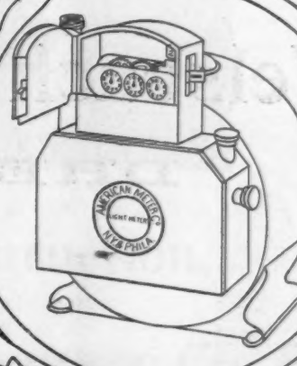




TOTAL HOURS LIGHTING DURING 1898.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	210.40	January	423.20
February	186.40	February	355.25
March	181.20	March	355.35
April	166.10	April	298.50
May	156.40	May	264.50
June	144.30	June	234.25
July	147.30	July	243.45
August	157.10	August	280.25
September	169.50	September	321.15
October	186.00	October	374.30
November	204.30	November	401.40
December	218.30	December	433.45
Total, yr.	2129.30	Total, yr.	3987.45





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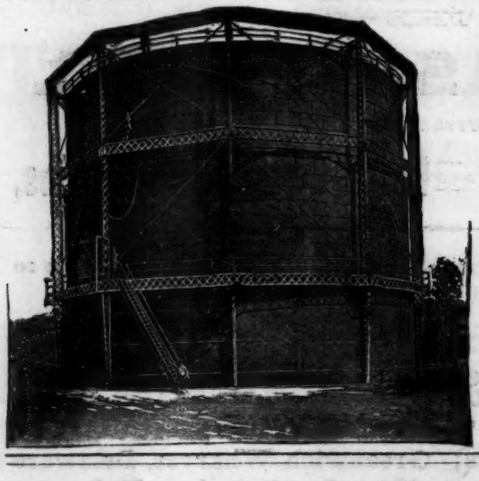

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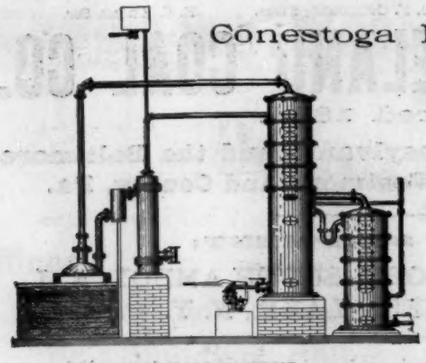

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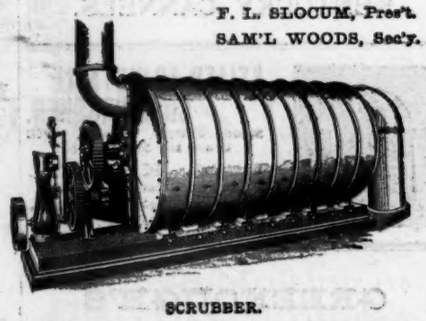

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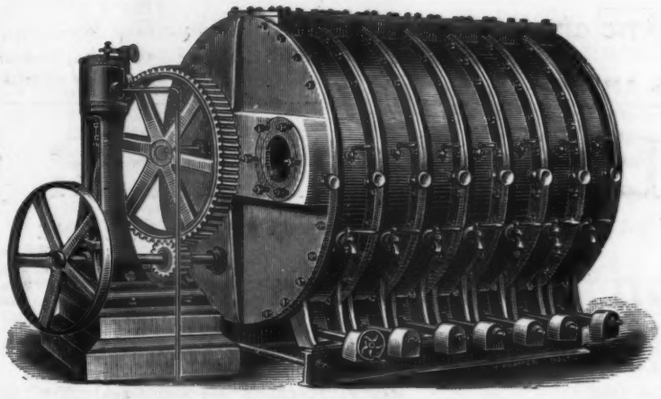

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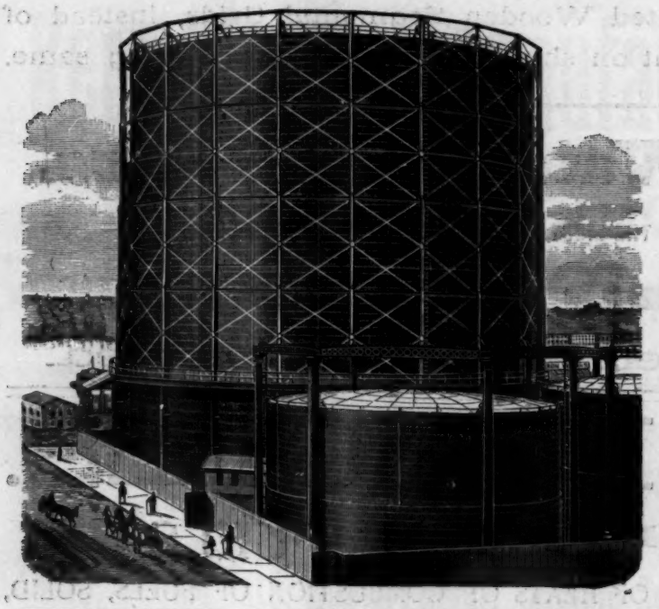

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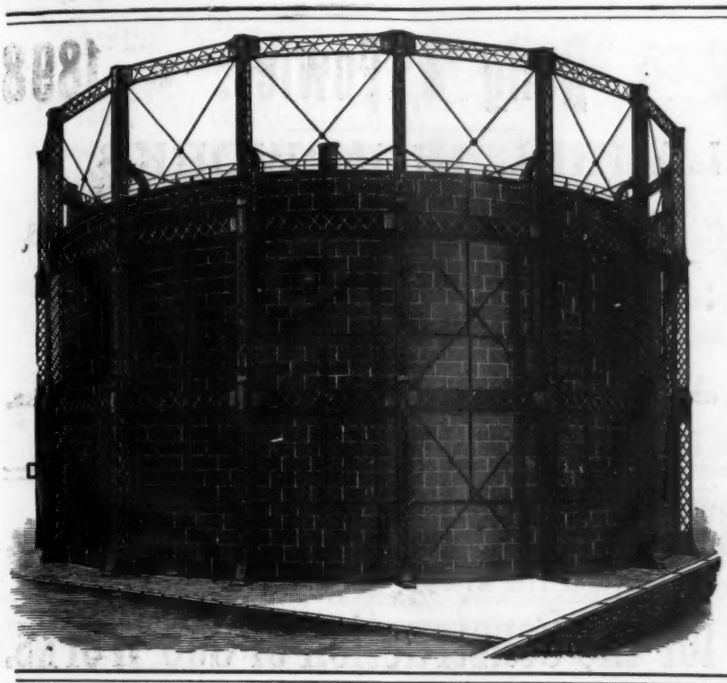

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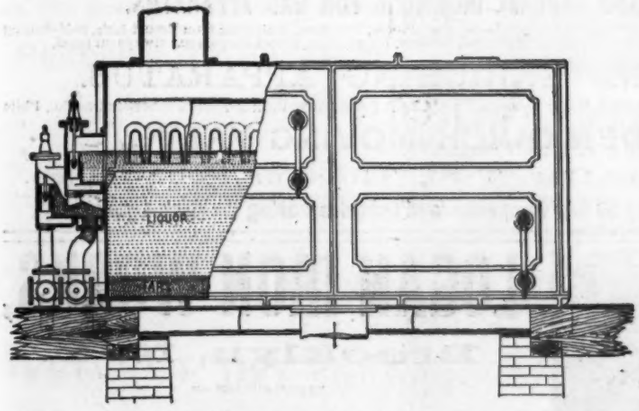

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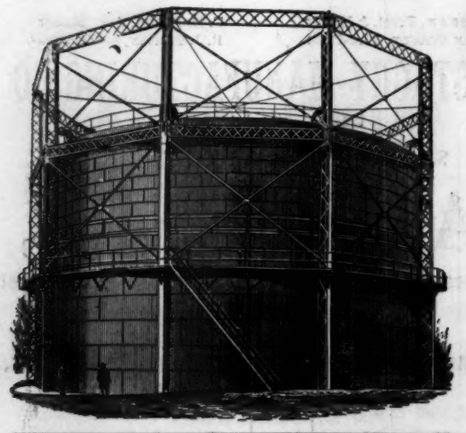

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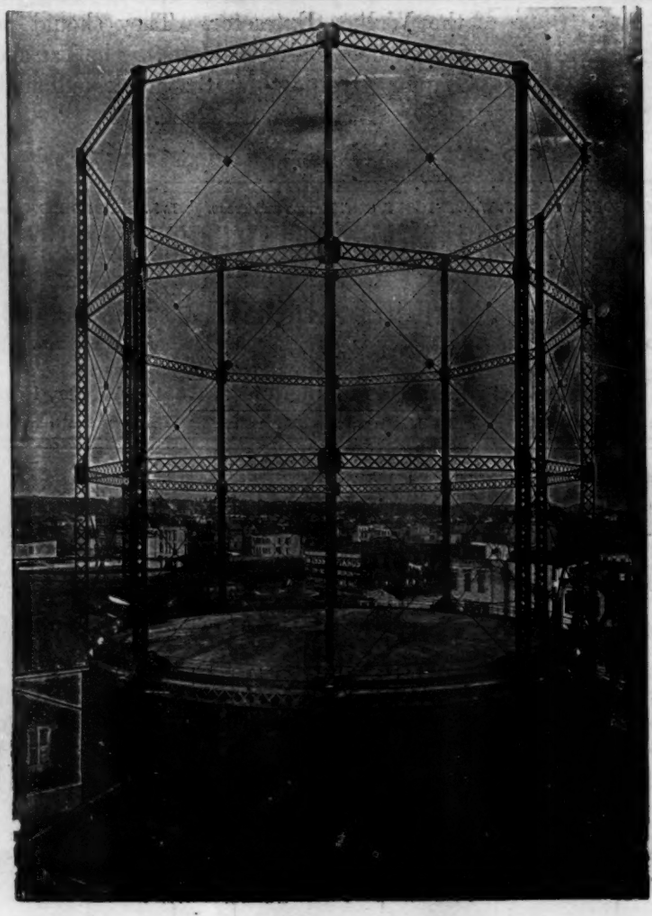

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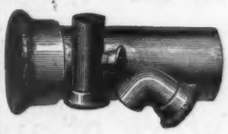

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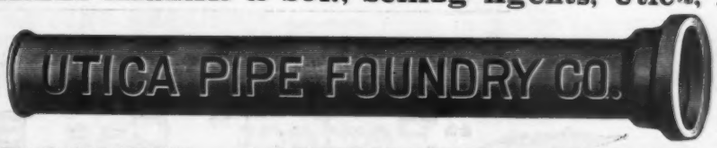

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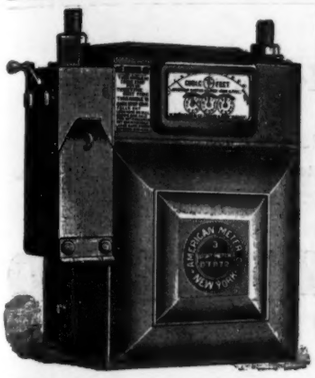

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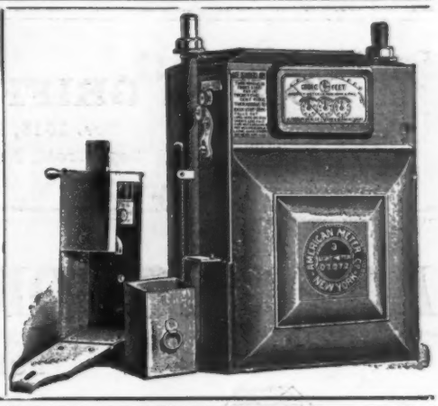

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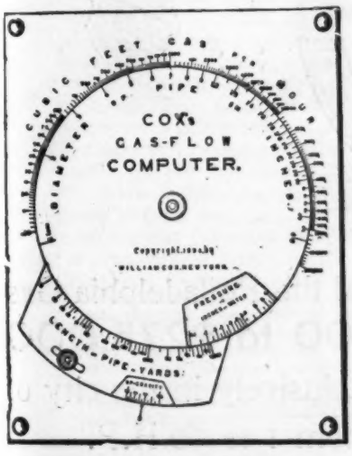

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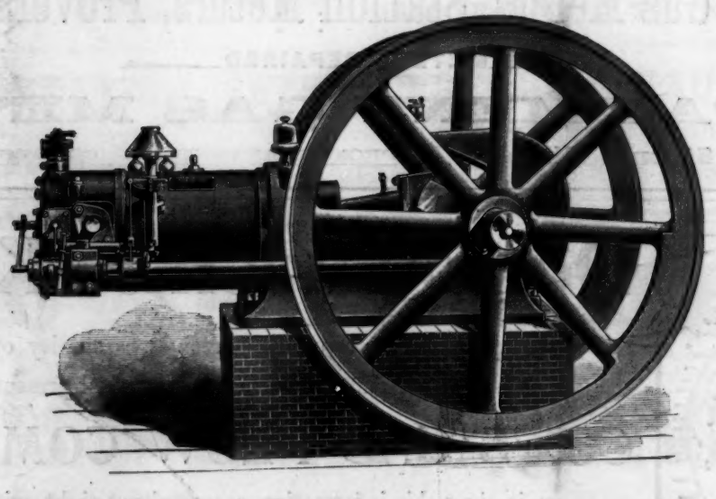

The United Gas Improvement Company, by the lease of the Philadelphia Gas Works, derives a yearly revenue estimated at **$250,000 to $275,000** from the sale of gas consumed by OTTO GAS ENGINES exclusively in the city of Philadelphia, there being over 700 engines in use, ranging from 1 to 50 H.P.

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